PB87-190120

Superfund Record of Decision (EPA Region 5)
Burrows Sanitation Site, Hartford
Van Buren County, Michigan, September 1986

(U.S.) Environmental Protection Agency
Washington, DC

30 Sep 86

U.S. Department of Commerce
National Technical Information Service

PB87-190120

United States
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Office of
Emergency and
Remedial Response

EPA/ROD/R05-86/037
September 1986

EPA

Superfund Record of Decision:

Burrows Sanitation, MI

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TECHNICAL REPORT DATA (Please read Instructions on the reverse before completing)		
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15. SUPPLEMENTARY NOTES		

16. ABSTRACT

The Burrows Sanitation site is a ten-acre site located on 54th Avenue in Hartford Township, Van Buren County, Michigan. This site was used for dewatering and disposing of metal hydroxide sludges, waste coolants, and soluble oils. Located within a three-quarter mile radius of the site are approximately 150 people living in thirteen permanent residences and a trailer park. These homes obtain water from private wells. Access to the site is restricted by a snow fence, but some sections of the fence are in poor condition, allowing sportsmen and skiers easy access. Two wetland areas, the East Wetland and the Northwest Wetland, are located on the eastern and northwestern edges of the site. The Northwest Wetland was created artificially by the construction of an earthen dam. In July 1984, under a CERCLA Administrative Order by Consent, responsible parties excavated and removed sludges and contaminated soils from four onsite waste disposal areas. Sampling of these areas indicates that the former source materials were removed so they no longer present a potential health threat via direct contact or ingestion. Wastes similar to the excavated wastes remain in the newly identified Spill Area No. 2. Principal contaminants include chromium, copper, lead, nickel, zinc, and cyanide. Test results also indicate that the surface water and sediments in the Northwest Wetland and drainage canal have been impacted by the site. In addition, onsite monitoring wells indicate a limited chemical plume or plumes related to site
(See Attached Sheet)

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision Burrows Sanitation Site, MI Contaminated Media: gw, sw, soil, sediment Key contaminants: heavy metals, inorganics		

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16. ABSTRACT (continued)

activities. Residential wells in the site vicinity have not been impacted by site contaminants.

The cost-effective remedial action selected for this site includes: purge and treat the contaminated ground water for approximately 3 years, drain the artificial Northwest Wetland; remove and treat approximately 250 cubic yards of metal hydroxide sludge from Spill Area No. 2 and the Northwest Wetland; and dispose of the treated waste at an offsite RCRA facility. Total estimated capital cost for the selected remedial action ranges from $1,256,700 to $1,335,400 depending on the distance to the offsite RCRA facility with O&M costs of $115,000.

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

Site: Burrows Sanitation, Hartford, Van Buren County, Michigan

Documents Reviewed

I have reviewed the following documents describing the analysis of the cost-effectiveness of remedial action alternatives for the Burrows Sanitation Landfill.

- Remedial Investigation Report, Burrows Sanitation Landfill
- Feasibility Study, Burrows Sanitation Landfill
- Public Comments and Recommendations
- Responsiveness Summary

Description of Selected Remedy

- Purge and treat for approximately 3 years the contaminated groundwater.
- Drain the artificial Northwest Wetland.
- Remove and treat approximately 250 cubic yards of metal hydroxide sludge from Spill Area No. 2 and the Northwest Wetland. Dispose the treated waste at an off-site RCRA facility which is in compliance with the EPA policy.

Declarations

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 U.S.C. 9601 et seq., and the National Contingency Plan (40 CFR Part 300), I have determined that the above multi-action remedy is a cost-effective remedial measure which attains or exceeds applicable or relevant and appropriate Federal public health and environmental requirements that have been identified at the site, and provides adequate protection of public health, welfare and the environment. I have also determined that the actions described herein are cost-effective when compared to other remedial actions reviewed, in accordance with the National Contingency Plan. The State of Michigan has been consulted, and their comments have been incorporated into the Record of Decision. In addition, the groundwater and Northwest Wetland remedies will require future operation and maintenance to ensure the continued effectiveness of the remedy. These activities will be considered part of the approved action and eligible for Trust Fund monies for a period not to exceed 5 years.

I have also determined that the multi-action remedy has been approved for funding from the Hazardous Substance Response Trust Fund.

September 30, 1986.
Date

Valdas V. Adamkus
Regional Administrator

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

BURROWS SANITATION

I. SITE LOCATION AND DESCRIPTION

The Burrows Sanitation (Burrows) site is located on 54th Avenue in Hartford Township, Van Buren County, Michigan (Figure 1). It comprises approximately ten acres in a rural area one mile northeast of Hartford. The site occupies the southeast quarter of the northeast quarter of Section 10, Township 3 South, Range 16 West. Burrows was placed on the National Priorities List (NPL) in September 1984.

There are approximately 150 people living in thirteen permanent residences and a trailer park located within a 3/4 mile radius of the site. All the homes obtain water from private wells that vary in depth from 45 to 100 feet.

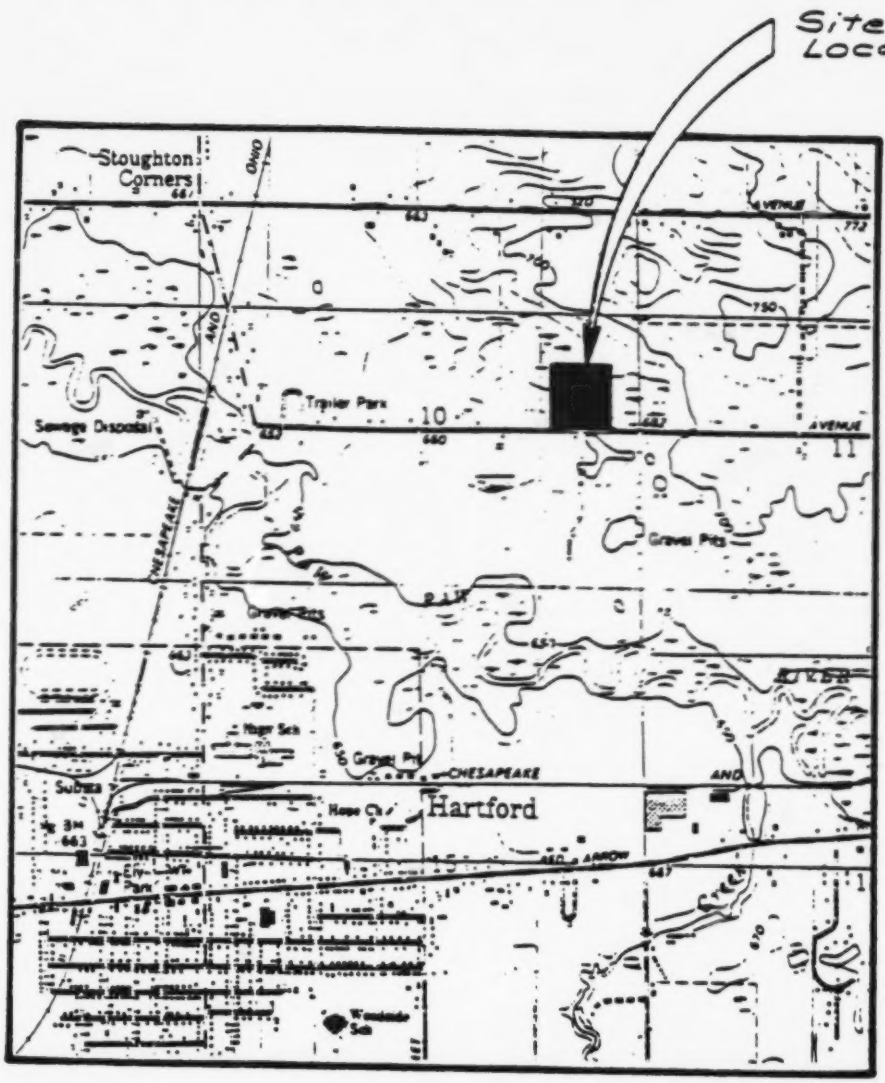
A large number of hardwood trees exist within the site boundaries. In addition, the site exhibits some evidence of wildlife. Access to the site was unrestricted until 1984 which permitted hunters, cross-country skiers, and nature enthusiasts to frequent the area. A snow fence barrier was constructed around the site in early 1984, but some sections of the fence are in poor condition allowing easy access.

There are two wetland areas, the East Wetland and the Northwest Wetland, along the eastern and northwestern edges of the site. The Northwest Wetland was artifically created by the construction of an earthen dam. The wetland areas are interconnected and drained by a drainage canal known as the Doyle Drain which flows along the northern perimeter of the site. The Doyle Drain enters the Paw Paw River about 3/4 mile to the southwest of the site.

The on-site waste disposal areas identified prior to the Remedial Investigation/ Feasibility Study (RI/FS) included the following:

- ° Spill Area - located at the northwest area of the site. The Spill Area was approximately 150 feet by 40 feet with a slope towards the northwest.
- ° Washout Areas - located in the northeast portion of the site. There was an Upper Washout Area and a Lower Washout Area. The total of both washout areas was approximately 36,000 square feet.
- ° Cyanide Trail - located in the southcentral and southeast portions of the site. The Cyanide Trail was about 400 feet by 30 to 40 feet with a gentle slope towards the east.
- ° Unlined Pits No. 1 to 6 - located in the central part of the site. The pit areas varied from about 20 feet to 100 feet by 100 feet.

Sludges and contaminated soils were removed from these previously identified waste disposal areas in 1984. These areas are referred to collectively



VICINITY MAP
BURROWS SANITATION LANDFILL

REF.: USGS. HARTFORD, MICH.
NW/4 HARTFORD 15' QUADRANGLE
N4207.5 - W8607.5/7.5
1981

Fig. 1

as the "excavated areas" of the site. On-site areas outside of the waste disposal areas where no soil excavation has taken place are referred to as the "unexcavated areas" of the site.

During the RI one previously unidentified on-site waste disposal area was found. This area is identified as:

° Spill Area No. 2 - located in the northwest corner of the site. This disposal area covers about 6000 square feet on a slope towards the northwest. The adjacent wetland sediment has been contaminated for a limited extent.

The locations of these previous and existing waste disposal areas are shown in Figure 2.

II. SITE HISTORY

The relevant history of events and past ownership of the Burrows site is as follows:

° Duane and Evelyn Funk owned Burrows site from 1970 to 1979. Elmer Burrows operated the Burrows site from 1970 to 1977.

° While Mr. Burrows operated the site, it was used for dewatering and disposing of metal hydroxide sludges, waste coolants and soluble oils. Wastes were disposed in six unlined pits and in the Spill, Washout and Cyanide Trail areas.

° In 1976, the Michigan Department of Natural Resources (MDNR) sampled the wastes at the site and found elevated levels of copper, chromium, and cyanide which exceeded the allowable state limits.

° In 1979, the MDNR instructed Mr. Burrows to remove all the sludges from the pits. Mr. Burrows removed approximately 80 cubic yards out of approximately 8600 cubic yards of sludge from the pits.

° Douglas and Georgia Mackinder purchased the site in 1979 and are the present owners.

° In 1980, the MDNR sampled the sludge in the pits, the Doyle Drain and Cyanide Trail area. Analysis of these samples indicated the following maximum levels of heavy metals, arsenic and cyanide concentrations:

Chromium	130,000 mg/kg
Copper	160,000 mg/kg
Lead	360 mg/kg
Nickel	110,000 mg/kg
Zinc	40,000 mg/kg
Arsenic	0.8 mg/kg
Cyanide	21,000 mg/kg

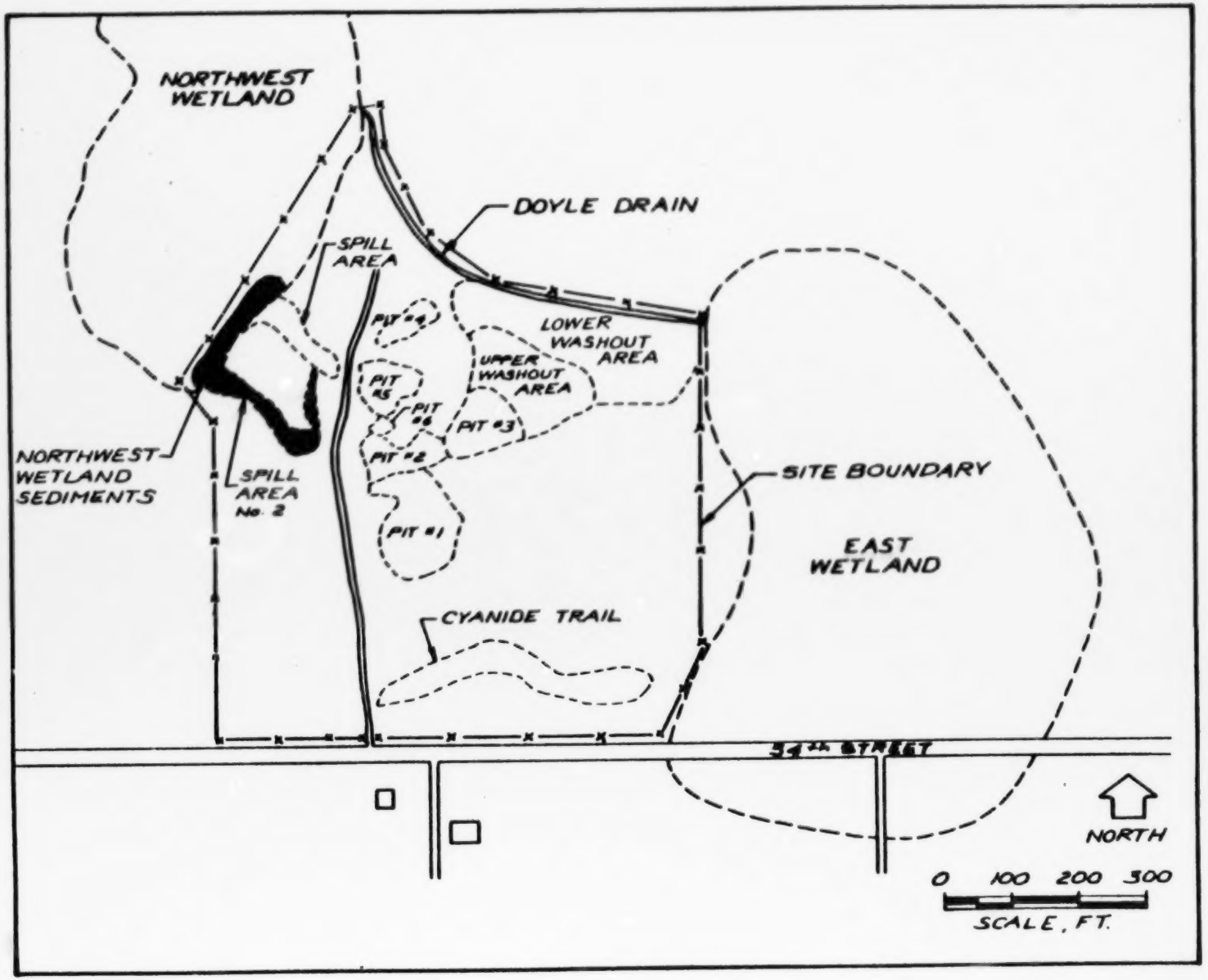

NORTHWEST WETLAND
DOYLE DRAIN
SPILL AREA
PIT #4
LOWER WASHOUT AREA
UPPER WASHOUT AREA
PIT #5
PIT #6
PIT #3
PIT #2
NORTHWEST WETLAND SEDIMENTS
SPILL AREA No. 2
SITE BOUNDARY
PIT #1
EAST WETLAND
CYANIDE TRAIL
54th STREET
NORTH
0 100 200 300
SCALE, FT.

Fig. 2

° In 1982, the MDNR installed three monitoring wells and performed a limited hydrogeological investigation of the site. The investigation indicated ground water contamination at the site. In addition to previously discovered contaminants, styrene was also found in a water sample from one well (MDNR 1) at a concentration of 130 ug/l. The source of the styrene was never determined.

° In March 1983, the United States Environmental Protection Agency (EPA) Field Investigation Team (FIT) contractor installed seven additional monitoring wells at the site.

° In October 1983, the MDNR surveyed the site and discovered a black tarry material in Pit No. 4.

° In January 1984, a toxicologist with the MDNR determined that the metal hydroxide sludges on the surface of the site were at levels considered hazardous to humans upon direct dermal contact and inhalation.

° In February 1984, the EPA Technical Assistance Team (TAT) contractor conducted an inspection of the site. During the inspection, samples were collected from the pits, Spill Area, Washout Area, Cyanide Trail and Doyle Drain.

° In June 1984, the EPA issued a unilateral CERCLA Section 106(a) Administrative Order to the identified potentially responsible parties (PRPs) to excavate and remove sludges and contaminated soil from the site. The PRPs were Elmer Burrows, Duane and Evelyn Funk, Douglas and Georgia MacKinder, Auto Specialties Manufacturing Company, Du-Wel Products, Inc. and Whirlpool Corporation.

° In July 1984, Duane and Evelyn Funk, Whirlpool Corporation, Du-Wel Products, Inc. and Automotive Specialties Manufacturing Co. agreed in a CERCLA Section 106 (a) Administrative Order by Consent to excavate and remove sludges and contaminated soil from the site.

° In March 1985, the PRPs were given the opportunity to perform the RI/FS and, subsequently, declined.

° In August 1985, EPA authorized Work Assignment No. 80-5L76.5 to the REM II Team to implement the RI/FS.

° In November 1985, EPA initiated the RI/FS.

III. CURRENT SITE STATUS

A RI/FS at the Burrows site was authorized by EPA on August 16, 1985. The purpose of the RI was to determine the thoroughness of previous clean up activities, to evaluate the nature and extent of ground water contamination and the residual soil contamination, to characterize pathways of contaminant migration off-site, and to determine risks to human health and the environment from the contaminants.

The RI field activities began in November 1985 and included the following:

- ° sampling and analysis of on-site and off-site soils,
- ° sampling and analysis of on-site and off-site ground water,
- ° sampling and analysis of surface water and sediments,
- ° a hydrogeological study, and
- ° an Endangerment Assessment.

Six chemicals (chromium, copper, lead, nickel, zinc and cyanide) were selected as representative of the former on-site sludges and were the focus of the characterization of soils, sediments, surface water, and ground water at or near the Burrows site. These six chemicals are designated as the inorganic indicator chemicals (indicator chemicals). The range of concentrations of these chemicals found in various environmental media at and near the Burrows site are summarized in Table 1. The contaminants identified on-site are defined as hazardous substances under Section 101 (14) of CERCLA.

The following sections present the finding of the RI as to existing conditions.

A. Disposal Areas

During the course of the RI data collection activity, a previously unidentified spill area, Spill Area No. 2, was discovered. Blue-green sludge residues not visible at the surface were observed in shallow shovel-dug excavations at a depth of one to two inches. The extent of the Spill Area No. 2 is shown in Figure 2. One boring, SL202, was located within Spill Area No. 2 at the transition zone with natural soils (Table 5). This sample had a similar composition to previously collected samples from the on-site sludges. The test results for the unexcavated areas did not indicate any other on-site areas of heretofore undiscovered waste deposition.

Some vegetative stress was observed in the trees and shrubs growing in the Spill Area No. 2 as evidenced by the lower density of vegetation than surrounding areas. This lower density of vegetation is considered to be the result of surface soil wash covering the area during and subsequent to disposal activities.

The indicator chemicals occur naturally as the components of soils in the site vicinity. Concentrations of these compounds measured in on-site soils in the excavated and unexcavated areas were interpreted in the context of their background range. The test results for the indicator chemicals at representative background locations are shown in Table 2.

1. Perimeter of Excavated Areas

In the majority of on-site soil samples the residual concentrations were comparable to natural background concentrations in all locations (e.g., pit areas and unexcavated areas). Approximately 15 percent of the soil samples exhibited

Table 1

SUMMARY OF INORGANIC INDICATOR CHEMICAL CONCENTRATIONS
FOUND IN ENVIRONMENTAL MEDIA
BURROWS SANITATION LANDFILL SITE
(Sampled between November 20, 1985 and May 20, 1986)

	Waste Source[3] Materials mg/kg = ppm	Soils In Excavated Areas mg/kg = ppm	Soils At Perimeters of Excavated Areas mg/kg = ppm	Soils In Unexcavated Areas mg/kg = ppm	Background Soils mg/kg = ppm	Sediments In Wetlands and Doyle Drain mg/kg = ppm	Surface[1] Water In Wetlands and Doyle Drain mg/l = ppm	Ground[2] Water In On-Site Wells mg/l = ppm	Ground[1] Water In Nearby Residential Wells mg/l = ppm
Chromium	960 - 84,000	ND - 1800	ND - 1650	ND - 1630	ND - 14	3.8 - 867	ND - 5.700	ND - 0.113	ND
Copper	2900 - 15,000	ND - 1400	ND - 260	ND - 1160	ND - 20	6 - 286	0.007 - 1.520	ND - 0.153	ND - 0.012
Lead	26 - 1,200	ND - 92	ND - 45.3	ND - 136	ND - 66	ND - 56	ND - 0.809	ND - 0.119	ND - 0.003
Nickel	1500 - 40,000	ND - 900	ND - 266	ND - 81	ND - 20	ND - 165	ND - 1.840	ND - 0.200	ND
Zinc	520 - 13,000	13 - 128	11.5 - 107	7.3 - 77	ND - 100	8.7 - 213	0.020 - 1.620	0.130 - 7.229	ND - 0.376
Cyanide	0.9 - 63	ND - 7.8	ND	ND - 11	ND - 1.7	ND	ND	ND - 0.010	ND

ND = Not Detected at Instrument Detection Level
(1) Based on Total Concentrations of Chemical in Water
(2) Based on Dissolved Concentrations of Chemical in Water
(3) Based on composite samples of wastes by EDI, July 1984

Table 2

BACKGROUND SOIL DATA
INORGANIC INDICATOR CHEMICALS
(Sampled between December 11, 1985 and December 20, 1985)
units are in mg/kg = ppm

PARAMETERS AND DEPTH	SOUTH 200-400 ft SL601	SOUTH 200-400 ft SL602	SOUTH 1-3 mile SL703	NORTH 200-400 ft SL607	NORTH 200-400 ft SL608	NORTH 1-3 mile SL704	EAST 200-400 ft SL605	EAST 200-400 ft SL606	EAST 1-3 mile SL702	WEST 200-400 ft SL603	WEST 200-400 ft SL604	WEST 1-3 mile SL701
Chromium												
0.0-1.5 ft	6.2	(4.0)	(4.2)	2.3u	2.2u	8.1	2.2u	2.2u	8.7	(2.4)	(2.4)	9.5
1.5-3.0 ft	7.3	(4.9)	7.7	6.9	2.1u	11.0	2.2u	2.2u	14.0	8.7	6.0	7.4
3.0-4.5 ft	(5.1)	(4.3)	14.0	7.9	2.3u	14.0	2.1u	2.2u	13.0	9.2	8.4	13.0
4.5-6.0 ft	11.0	(4.8)	12.0	8.9	2.4u	9.1	2.1u	2.2u	11.0	8.5	13.0	12.0
Copper												
0.0-1.5 ft	(6.6)	(5.2)	(9.2)	(6.0)	1.6u	17.0	(6.1)	(4.3)	(8.3)	(4.9)	(6.9)	(7.6)
1.5-3.0 ft	(7.7)	(5.4)	(7.8)	(11.0)	1.6u	(11.0)	(2.8)	(1.9)	15.0	(9.5)	(8.6)	(9.4)
3.0-4.5 ft	(6.3)	(4.7)	17.0	(14.0)	1.7u	20.0	(1.6)	(5.0)	16.0	(12.0)	15.0	(12.0)
4.5-6.0 ft	(6.3)	(4.5)	19.0	(13.0)	1.8u	(14.0)	(3.5)	(5.6)	16.0	(12.0)	19.0	(11.0)
Lead												
0.0-1.5 ft	6.7	13.0	12.0	9.1	16.0	66.0	16.0	8.9	8.1	30.0	29.0	9.9
1.5-3.0 ft	20.0	3.6	5.2	12.0	2.7u	6.1	6.5	2.7u	12.0	6.7	7.9	7.0
3.0-4.5 ft	6.5	2.7u	6.0	14.0	2.8u	8.0	4.3	3.3	6.5	11.0	22.0	9.4
4.5-6.0 ft	5.7	2.8u	5.4	11.0	3.0u	5.7	2.7u	3.4	5.6	11.0	12.0	9.5
Nickel												
0.0-1.5 ft	(5.4)	3.8u	4.2u	4.0u	3.8u	(7.4)	3.9u	3.9u	(6.6)	4.0u	4.0u	(9.3)
1.5-3.0 ft	(6.6)	4.9u	(8.2)	(7.8)	3.7u	(10.0)	3.8u	3.8u	(12.0)	(9.1)	(4.6)	(10.0)
3.0-4.5 ft	(4.6)	3.8u	(12.0)	(11.0)	4.0u	(20.0)	3.7u	3.8u	(15.0)	(8.4)	(16.0)	(14.0)
4.5-6.0 ft	(8.4)	(4.8)	(14.0)	(13.0)	4.2u	(15.0)	3.7u	3.9u	(14.0)	(11.0)	(16.0)	(14.0)
Zinc												
0.0-1.5 ft	31.0	23.0	35.0	19.0	(7.8)	100.0	15.0	18.0	26.0	14.0	18.0	39.0
1.5-3.0 ft	34.0	22.0	28.0	31.0	(1.1)	40.0	(11.0)	(5.7)	54.0	25.0	23.0	39.0
3.0-4.5 ft	26.0	12.0	41.0	43.0	(1.4)	49.0	(5.3)	(8.9)	47.0	33.0	34.0	65.0
4.5-6.0 ft	30.0	(10.0)	52.0	54.0	1.2u	37.0	(7.1)	(9.7)	49.0	32.0	45.0	51.0
Cyanide												
0.0-1.5 ft	0.56u	0.55u	0.6u	0.57u	0.55u	0.59u	0.56u	0.56u	0.58u	0.57u	0.57u	0.58u
1.5-3.0 ft	0.56u	0.56u	0.62u	0.57u	0.53u	0.61u	1.1	0.54u	0.61u	0.56u	0.56u	0.58u
3.0-4.5 ft	0.6u	0.54u	0.6u	0.6u	0.57u	0.62u	0.53u	0.55u	0.59u	1.7	0.58u	0.59u
4.5-6.0 ft	0.57u	0.57u	0.61u	0.6u	0.6u	0.6u	0.97	0.56u	0.59u	0.56u	0.59u	0.6u

Notes:

u = Indicates the element was analyzed for but not detected. The detection limit value preceeds u (e.g. 10u).
( ) = Indicates the result is a value greater than or equal to the instrument detection limit but less than the contract required detection limit (e.g. (10))

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higher concentrations of one or more indicator chemicals than the upper limit of background concentrations (background). Most perimeter samples slightly exceeded background. Concentrations above background were found mostly at the perimeters of and within the excavated areas. The elevated concentrations were generally confined to the upper soil layer and were within one foot of the ground surface (Table 3 and Figure 3).

Additionally, soil samples from central locations in Pits No. 1 and 4 were tested for priority pollutant organic compounds. The purpose of this testing was to assess the composition of a black tarry material found in certain areas of the site. The priority pollutant analyses did not reveal the presence of detectable organic compounds.

Visual observations by RI field personnel further support that no significant quantities of wastes remain at the excavation perimeters. Limited amounts (a few shovel fulls) of waste residue were visually noted along the Cyanide Trail Area excavation (Sample No. SL003 CN). Minimal waste residue was visually noted on the perimeter of the other excavations. The test results for the indicator chemicals in soils adjacent to all the excavated areas are shown in Tables 3 and 4. Collectively and individually, the results for the soil samples within the excavation perimeters are below levels which would be indicative of the presence of significant quantities of waste materials. Based on the test results discussed above and on the visually observed condition of the soils at the excavation perimeters of the Cyanide Trail Area, Pits, Washout and Spill Areas, the RI concluded that the former waste source materials in these areas have been removed by the past removal activities so that they are no longer a potential human health threat via direct contact and ingestion.

2. Excavated Areas

Elevated concentrations of the indicator chemicals were measured at various locations in the Cyanide Trail and Pits excavations. There appears to be a trend toward a lower percentage of elevated concentrations in the interior of the excavated areas than at the perimeters. Results for sample points within the Washout and Spill Area excavations were within or only slightly exceeded the background range. The test results for the indicator chemicals in soils within the excavations are shown in part in Table 5 and in Table 6.

At the on-site soil sample points where elevated indicator chemical concentrations were found, the highest concentrations above background were measured in the samples collected from the ground surface to a one foot depth.

All results for soils below a two foot depth were within background range. The concentration distributions observed in the shallow soil profile, and the results shown for soils at deeper depths (to the water table) appear to indicate that the soils immediately underlying the former waste materials effectively retarded migration of contaminants, and that the deeper soils have remained largely unaffected by the surface disposal activities. Since wastes have been removed from the site, except for Spill Area No. 2, future deterioration of the quality of these soils is unlikely.

Table 3

COMPOSITE SOIL SAMPLE DATA ADJACENT TO EXCAVATED AREAS
INORGANIC INDICATOR CHEMICALS
(Sampled on November 23, 1985 and November 24, 1985)
units are in mg/kg

PARAMETERS	SL005		SL006		SL007		SL008		SL009		SL010		SL011		SL012		SL013		SL014	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
CHROMIUM	303	4.4u	214	119	228	16.2	25.0	8.66	881	336	64.1	70.0	346	74.4	94.6	9.82	1120	181	28.4	9.58
COPPER	66.6	8.8u	80.2	29.2	35.8	9.3u	(13.2)	9.9u	157	42.3	9.2u	9.2u	93.0	9.1u	15.4	8.7u	260	17.6	9.5u	9.0u
LEAD	3.87u	1.6u	21.7	4.92	11.1	7.31	11.7	7.48	45.3	14.7	6.87	4.05	14.1	10.8	12.4	4.2	20.0	8.0	6.88	8.18
NICKEL	120	(12.6)	266	50.9	40.1	(20.9)	(25.0)	(21.6)	97.4	32.9	(17.3)	(12.7)	97.0	29.2	75.2	(14.2)	95.0	(14.2)	(18.4)	24.8
ZINC	45.7	13.2	50.6	31.5	44.8	36.0	37.5	32.8	73.9	30.6	38.1	31.2	59.4	36.4	35.3	11.5	64.6	32.4	27.3	29.3
CYANIDE	6.9u	5.5u	5.8u	5.7u	6.1u	5.8u	7.3u	6.2u	5.6u	5.6u	5.8u	5.8u	5.7u	5.7u	5.7u	5.5u	6.5u	5.9u	5.9u	5.6u
pH,Extractable	6.8	5.4	6.9	6.8	5.5	4.6	5.2	5.4	7.4	6.8	7.1	6.0	5.7 7.8D	7.6 7.1D	7.0	7.1	6.8 6.5D	5.5 6.8D	6.3	5.9
Total Volatile Solids %	1.0	0.6	1.6	1.1	2.8	1.5	8.0	1.9	1.8	1.1	0.3	1.4	1.2 1.9D	2.0 1.4D	1.2	1.7	3.8 2.0D	0.8 1.0D	2.0	0.9

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Notes:
A - 0 to 1 ft depth
B - 1 to 2 ft depth
u - Indicated element was analyzed for but not detected. The detection limit value preceeds u (e.g. 10u).
( ) - Indicates the result was7 a value greater than or equal to the instrument detection limit but less than the contract required detection limit (e.g (10)).
D - Duplicate
Cyanide Trail: SL001, SL002, SL003 & SL004
Pit No. 1: SL005 & SL006. Pit No. 2, 3 & Washout Areas: SL007, SL008, SL009, SL010
Pit No. 5: SL011. Pit No. 4: SL012. Spill Area: SL013 & SL014.

FIGURE 3

See Figure 1-3
Remedial Investigation Report-Burrows Sanitation
August 19, 1986

Table 4

COMPOSITE SOIL SAMPLE DATA
ADJACENT TO CYANIDE TRAIL AREA
INORGANIC INDICATOR CHEMICALS
(Sampled between November 21, 1985 and December 18, 1985)
units are in mg/kg

PARAMETERS	SL004		SL003		SL002		SL003	SL001		SL301
	0-1 Ft	1-2 Ft	0-1 Ft	1-2 Ft	0-1 Ft	1-2 Ft	CN	0-1 Ft	1-2 Ft	3.5-5 Ft
CHROMIUM	7.5	(3.5)	79.0	8.1	1,650.0	14.0	3,410.0	14.0	6.1	6.6
COPPER	24.0	(5.2)	(10.0)	(7.4)	47.0	(8.2)	3,950.0	24.0	(7.2)	(11.0)
LEAD	6.7	2.8u	11.0	5.5	18.0	5.2	37.0	6.3	(2.8)	7.4
NICKEL	26.0	(12.0)	(12.0)	(12.0)	80.0	(16.0)	3,650.0	(21.0)	(17.0)	(8.2)
ZINC	24.0	15.0	27.0	20.0	107.0	25.0	678.0	29.0	17.0	37.0
CYANIDE	0.56u	0.56u	0.63u	0.63u	0.63u	0.59u	60.0	0.57u	0.54u	0.57u
pH, Extractable	5.6	5.8	5.2	4.9	5.7	5.3	*	6.6	7.1	6.7
Total Volatile Solids (%)	1.3	0.3	6.7	4.5	5.9	2.3	*	2.0	0.6	0.7

Notes:
SL003CN was a blue green sample of mixed waste and soil located in the SL002 sample area.
* = parameter was not tested
( ) = Indicates the result was a value greater than or equal to the instrument detection limit but less than the contract required detection limit (e.g. (10)).
u = Indicates element was analyzed for but not detected. The detection limit value preceeds u (e.g. 10u).

Table 5

0-6 FT MEDIUM DEPTH SOIL SAMPLE DATA
INORGANIC INDICATOR CHEMICALS
(Sampled between December 13, 1985 and December 20, 1985)
units are in mg/kg

PARAMETERS AND DEPTH	SL 208	SL 209	SL 210	SL 201	SL 202
CHROMIUM					
0.0-1.5 ft	(5.0)	21.0	(5.3)	2.3u	1,630.0
1.5-3.0 ft	(3.9)	13.0	12.0	(2.6)	41.0
3.0-4.5 ft	(4.9)	8.3	6.2	(4.1)	33.0
4.5-6.0 ft	6.4	9.4	(3.8)	6.7	(4.0)
COPPER					
0.0-1.5 ft	(4.7)	(8.3)	(9.1)	1.7u	1,160.0
1.5-3.0 ft	(4.1)	(8.2)	(6.0)	1.7u	38.0
3.0-4.5 ft	(7.0)	(7.5)	(5.1)	1.7u	41.0
4.5-6.0 ft	(10.0)	(9.4)	(4.6)	(6.6)	(3.4)
LEAD					
0.0-1.5 ft	4.0	7.5	7.1	3.8	41.0
1.5-3.0 ft	(2.9)	5.7	4.5	4.4	5.7
3.0-4.5 ft	3.3	5.8	5.2	4.0	11.0
4.5-6.0 ft	5.1	6.4	3.5	4.2	4.2
NICKEL					
0.0-1.5 ft	4.0u	(10.0)	(4.4)	4.0u	81.0
1.5-3.0 ft	(4.2)	(6.7)	(8.6)	4.0u	(14.0)
3.0-4.5 ft	4.0u	(5.3)	(4.5)	4.1u	(18.0)
4.5-6.0 ft	(4.9)	(7.4)	4.3u	4.2u	(4.0)
ZINC					
0.0-1.5 ft	22.0	45.0	25.0	(2.5)	77.0
1.5-3.0 ft	15.0	52.0	42.0	(6.5)	34.0
3.0-4.5 ft	16.0	27.0	20.0	(11.0)	51.0
4.5-6.0 ft	20.0	34.0	16.0	20.0	17.0
CYANIDE					
0.0-1.5 ft	0.57u	0.57u	0.6u	0.57u	6.5
1.5-3.0 ft	0.58u	0.57u	0.60u	0.57u	0.57u
3.0-4.5 ft	0.57u	0.58u	0.59u	0.58u	0.92
4.5-6.0 ft	0.57u	0.58u	0.62u	0.60u	0.54u

Notes:
u = Indicated element was analyzed for but not detected. The detection limit value preceeds u (e.g. 10u).
( ) = Indicates the result was a value greater than or equal to the instrument detection limit but less than the contract required detection limit (e.g. (10)).

Table 6

DEEP BORING SOIL SAMPLE DATA
INORGANIC INDICATOR CHEMICALS
(Sampled between December 18, 1985 and December 19, 1985)
units are in mg/kg

PARAMETERS AND DEPTH	SL 301	SL 302	SL 303	SL 304	SL 305	SL 306	SL 307	SL 308	SL 309
CHROMIUM									
3.5-5.0ft	6.6	22.0	16.0	7.0	(3.4)	8.2	12.0	104.0	7.3
8.5-10.0ft	--	18.0	7.0	--	--	--	7.9	--	13.0
13.5-15.0ft	--	--	--	--	--	--	--	--	(4.4)
18.5-20.0ft	--	--	--	--	--	--	--	--	12.0
COPPER									
3.5-5.0ft	(11.0)	22.0	16.0	(10.0)	(5.5)	(7.8)	15.0	52.0	16.0
8.5-10.0ft	--	25.0	16.0	--	--	--	(14.0)	--	19.0
13.5-15.0ft	--	--	--	--	--	--	--	--	(10.0)
18.5-20.0ft	--	--	--	--	--	--	--	--	20.0
LEAD									
3.5-5.0ft	7.4	10.0	9.4	4.3	4.9	5.2	8.3	19.0	7.8
8.5-10.0ft	--	12.0	4.8	--	--	--	7.7	--	11.0
13.5-15.0ft	--	--	--	--	--	--	--	--	5.2
18.5-20.0ft	--	--	--	--	--	--	--	--	7.6
NICKEL									
3.5-5.0ft	(8.2)	(20.0)	(19.0)	(8.1)	4.5u	(9.7)	(11.0)	74.0	(11.0)
8.5-10.0ft	--	(18.0)	62.0	--	--	--	(9.9)	--	(12.0)
13.5-15.0ft	--	--	--	--	--	--	--	--	(6.1)
18.5-20.0ft	--	--	--	--	--	--	--	--	(19.0)
ZINC									
3.5-5.0ft	37.0	54.0	67.0	17.0	14.0	19.0	43.0	47.0	48.0
8.5-10.0ft	--	78.0	46.0	--	--	--	42.0	--	95.0
13.5-15.0ft	--	--	--	--	--	--	--	--	27.0
18.5-20.0ft	--	--	--	--	--	--	--	--	58.0
CYANIDE									
3.5-5.0ft	0.57u	0.57u	0.59u	0.58u	0.64u	0.63u	0.56u	1.1	0.56u
8.5-10.0ft	--	0.60u	0.54u	--	--	--	0.6u	--	0.54u
13.5-15.0ft	--	--	--	--	--	--	--	--	0.52u
18.5-20.0ft	--	--	--	--	--	--	--	--	0.58u

Notes:
u = Indicated element was analyzed for but not detected. The detection limit value preceeds u (e.g. 10u).
( ) = Indicates the result was a value greater than or equal to the instrument detection limit but less than the contract required detection limit (e.g (10)).
-- = Sample was not taken

Soil samples were collected from four random locations in the Upper and Lower Washout Areas to assess the oil and grease-like material observed in these areas. Oil and grease were present in all of the samples tested at concentrations ranging from 51 to 294 mg/kg. Previous analysis of the discolored sand in the Washout Areas has indicated that the oil is a paraffinic substance which does not contain organic priority pollutants or other hazardous constituents.

3. Endangerment Assessment-Disposal Areas

The Endangerment Assessment indicated that exposure routes in the surface soils can occur via dermal absorption and direct or inadvertent ingestion of contaminated soil. Systemic toxicity is not expected by dermal exposure due to the typically low rates of dermal absorption of metals, particularly in the form in which metals primarily occur in surface soils (ligand complexes). Based on available studies of human sensitivity, dermatitis and sensitization are also not expected to result from contact with contaminants at the concentrations in the soil at the Burrows site (Endangerment Assessment, Chapter 7, Remedial Investigation Report, August 19, 1986).

Spill Area No. 2 had a similar composition and visual appearance to the wastes that were formerly present in the excavated areas. Consequently, it was assumed that the wastes in Spill Area No. 2 had similar concentrations of contaminants as those detected in samples of wastes from other locations on the site. It is difficult to quantify the potential chronic health risks associated with exposure to contaminants in Spill Area No. 2 since it is only a small area within the site and exposure under these conditions is likely to be intermittent. Using worst case exposure assumptions (maximum contaminant concentration and upper bound incidential ingestion rate of 100 mg of soil), it is estimated that an adult would ingest significant amounts of chromium and lead per exposure event when compared with estimated normal intakes via other routes of exposure. However, the likelihood that such intermittently high intakes would actually occur and the associated toxicological significance with regard to chronic health effects are not conclusive.

Acute risks to human health due to ingestion of chromium and copper, the only indicator chemicals with established acute health criteria were evaluated. The estimated 1-day most probable and worst case exposure event for a 10-kg child were compared with the 1-day USEPA Health Advisory values for these chemicals. Most-probable exposure estimates were derived using the geometric mean waste concentrations and a lower-bound soil ingestion rate of 100 mg/visit. Worst-case estimates were derived using the maximum waste concentrations and an upper bound ingestion rate of 500 mg/visit. Both the most-probable (0.15 mg/kg) and worst-case (4.2 mg/kg) estimates of exposure to chromium in soil at Spill Area No. 2 for a 10-kg child exceeds the 1-day health advisory for ingestion of chromium. The worst-case (0.75 mg/kg) estimate of exposure to copper in wastes at Spill Area No. 2 exceeds the 1-day health advisory for ingestion of copper, although the most-probable (0.06 mg/kg) estimate of exposure does not.

These results suggest that even a single visit to the Burrows site and subsequent contact with contaminated soils in Spill Area No. 2 may pose unacceptable health risks based on consideration of acute and subchronic health effects.

The Endangerment Assessment concluded that a health risk from direct contact or ingestion of soil does not exist outside of Spill Area No. 2. The RI determined that the residual metals concentrations were within natural background levels in 85 percent of the samples tested; the other 15 percent of the samples were between background levels and the maximum concentrations shown below:

	Concentrations (mg/kg)*		
Chemical	Burrows Background Geometric Mean	Burrows Endangerment Assessment Geometric Mean	Burrows Endangerment Assessment Maximum
Chromium	4	19	1,650
Copper	6	11	1,160
Lead	9	13	136
Nickel	4	11	266
Zinc	21	31	107

* Includes all samples collected on-site from a depth of 0-1.5 feet.

The above concentrations define the cleanup criteria for residual contaminated soils at the Burrow site. Soils exceeding the maximum concentrations values listed above will need to be remediated to eliminate the potential exposures.

B. Surface Water and Sediments

There are two wetlands adjacent to the site, the East Wetland and Northwest Wetland. The East Wetland is located upgradient from the site and shows slight evidence of stress on trees. The Northwest Wetland receives water from the East Wetland via the Doyle Drain. Approximately 90 percent of the hardwood trees in the Northwest Wetland have been heavily stressed by the increased water depth. The stress in each wetland area is related to an earthen dam which obstructs the natural drainage of the Northwest Wetland.

Test results for the indicator chemicals in surface water and sediment are shown in Tables 7 through 10. These results indicate that surface water and sediment in the Doyle Drain and the Northwest Wetland adjacent to the site have been impacted within thirty feet by prior disposal activities. Indicator chemicals in the surface water adjacent to the site were measured at concentrations exceeding Michigan Surface Water Criteria (Table 11). These criteria are based on the ability to support aquatic life. The surface water samples adjacent to the site in the Northwest Wetland (SW005, SW006) represent a limited fluid quantity (a few inches of standing water) in direct contact with the sediments. This limited quantity of fluid is considered to be representative of sediment fluids rather than the remaining volume of wetland waters.

Oil and grease were found in surface waters in the Doyle Drain and Northwest Wetland. The oil and grease found in the Washout Areas soils may have migrated through the ground into the water at the Doyle Drain. Previous analyses of

Table 7

SURFACE WATER DATA
(Sampled on December 12, 1985 and December 13, 1985)
units are in ug/l for metals and cyanide (Total)

PARAMETERS	SW 001	SW 002	SW 003	SW 004	SW* 005	SW 006	SW 007
CHROMIUM	4.0u	14.0	(8.2)	36.0	5700.0	867.0	4.0u
COPPER	(9.6)	6.6	(11.0)	149.0	1520.0	647.0	(6.5)
LEAD	9.3	5.0u	9.6	5.0u	105.0	809.0	5.0u
NICKEL	7.0u	7.0u	7.0u	(34.0)	1840.0	193.0	7.0u
ZINC	56.0	26.0	43.0	59.0	1020.0	1620.0	20.0
CYANIDE	10.0u	10.0u	10.0u	10.0u	10.0u	10.0u	10.0u
Units in mg/l							
OIL & GREASE	u	u	3.0	3.0	6.0	34.0	2.0
Total Suspended Solids	206.0	38.0	252.0	10.0	1720.0	6.0	38.0
Total Dissolved Solids	178.0	436.0	224.0	148.0	2960.0	308.0	270.0

Notes:

u = Indicated element was analyzed for but not detected. The detection limit value preceeds u (e.g. 10u).

( ) = Indicates the result was a value greater than or equal to the instrument detection limit but less than the contract required detection limit (e.g (10)).

* = SW005 may not represent surface water because of its high solid content.

Table 8

ADDITIONAL SURFACE WATER SAMPLES
AT NORTHWEST WETLAND
(Sampled May 20, 1986)
Units in ug/l

Parameter (Total)	SW008	SW009	SW010	SW011	SW012	SW013	SW014
Chromium	23	63	8u	8u	13	8u	8u
Copper	(18)	28	11u	11u	(12)	11u	11u
Lead	11	8	6	7	10	7	9
Nickel	20u	52	20u	20u	20u	20u	20u
Zinc	31	34	(13)	(16)	22	(18)	(19)

Table 9

SEDIMENTS DATA
INORGANIC INDICATOR CHEMICALS
(Sampled on December 12, 1985 and December 13, 1985)
units in mg/kg (ppm) unless noted

PARAMETER	SD 001	SD 002	SD 003	SD 004	SD 005	SD 006	SD 007
CHROMIUM	(7.8)	242.0	(6.1)	867.0	351.0	42.0	(3.8)
COPPER	(19.0)	(50.0)	(14.0)	286.0	81.0	47.0	(6.0)
LEAD	19.0	56.0	9.3	22.0	12.0	43.0	3.2u
NICKEL	(9.9)	(21.0)	5.9u	165.0	101.0	(19.0)	4.5u
ZINC	47.0	110.0	27.0	213.0	84.0	85.0	(8.7)
CYANIDE	1.1u	2.9u	0.85u	0.93u	0.72u	1.8u	0.64u
OIL & GREASE	166.0	312.0	188.0	179.0	126.0	236.0	95.0
TOTAL VOLATILE SOLIDS	78%	40%	63%	62%	82%	46%	82%

Notes:

u = Indicated the element was analyzed for but not detected. The detection limit value preceeds u (e.g. 10u).

( ) = Indicates the result was a value greater than or equal to the instrument detection limit but less than the contract required detection limit (e.g (10)).

Table 10

ADDITIONAL SEDIMENT SAMPLES
AT NORTHWEST WETLAND
(Sampled on May 20, 1986)
Units in mg/kg

Parameter (Total)	SD008	SD009	SD010	SD011	SD012	SD013	SD014
Chromium	21u	102	18u	49	7	20u	14
Copper	28u	(48)	25u	22u	7.3u	27u	11u
Lead	12	26	13	36	8	22	32
Nickel	52u	(43)	45u	40u	13u	50u	20u
Zinc	23u	19u	20u	(32)	6u	22u	(17)

TABLE 11

COMPARISON OF EXPOSURE POINT CONCENTRATIONS IN SURFACE WATER IN THE NORTHWEST WETLAND ADJACENT (WITHIN 30 FT) TO THE SITE TO MICHIGAN SURFACE WATER CRITERIA (MSWC)

Chemical	MSWC[a] (ug/liter)	Wetland Water Concentration (ug/liter)		Wetland Concentration MSWC Ratio	
		Geometric Mean	Maximum	Geometric Mean	Maximum
Chromium	69	44	867	0.64	13
Copper	28	62	2,314	2.2	83
Lead	5	14	809	2.8	160
Nickel	106	42	673	0.40	6.3
Zinc	130	89	2,100	0.68	16

[a] All criteria are for continuous exposure

odorous discolored sand in the Washout areas have indicated that the oil is a paraffinic substance which does not contain organic priority pollutants or other hazardous constituents.

1. Endangerment Assessment-Surface Water and Sediments

The Endangerment Assessment has identified the potential aquatic life exposure in the surface water near the site as potentially impacted by the waste disposal practices. The estimated concentrations of the indicator chemicals in the Northwest Wetland were compared to the Michigan Surface Water Criteria for the protection of aquatic life. These criteria vary with the hardness of the surface water. A hardness value of 190 mg/1 (as $CaCo_3$) was calculated for the Northwest Wetland. Maximum surface water concentrations and the geometric mean concentrations of copper and lead in this wetland exceed the Michigan criteria for all of the indicator chemicals. Based on the available data, it was concluded that the Northwest Wetland is not likely to support a wide diversity of aquatic life.

Runoff from the site and ground water discharge to the wetlands are no longer expected to be significant sources of contamination because no additional contamination has been introduced to the site. Consequently, the concentrations in the Northwest Wetland are not expected to increase over time. However, metals are not biodegradable so little reduction in contamination can be expected in the future.

Concentrations of the indicator chemicals in the Northwest Wetland water sampled farther from the site were lower than the Michigan Surface Water Criteria, with the exception of lead. The geometric mean and maximum concentrations for lead, 8.6 and 10 ug/liter respectively, both exceed the criteria of 5 ug/liter. The Endangerment Assessment in the RI reported that concentrations of lead in "unpolluted" surface water could range from 1 to 55 ug/liter with a median of 4 ug/1, indicating that concentrations of lead in the Northwest Wetland areas not adjacent to the site may be due to natural background. This has been supported by another sample from an independent wetland located nearby (SD001).

Additional sediment sampling will be conducted to determine the presence of any isolated "hot spots" that may exist at the base of two spill areas in the wetland during the remedial design activity (Figure 2). The cleanup criteria will be the same as that defined in Section III. A. However, the concentrations of the indicator chemicals in the Northwest Wetland and Doyle Drain sediments collected during the RI were significantly lower than the maximum concentrations measured in the surface soils at the Burrows site. Based on these results, the direct contact and ingestion of exposed sediments near the site will not pose risks to human health.

C. Ground Water

The subsurface soils underlying the Burrows site are generally comprised of coarsely stratified glacial outwash sands with occasional interbedded silt and clay lenses. The thickness of the glacial deposits at the site is approximately 150 to 160 feet. The Mississippian age Coldwater Formation bedrock underlying the glacial deposits is comprised of shale with thin limestone layers.

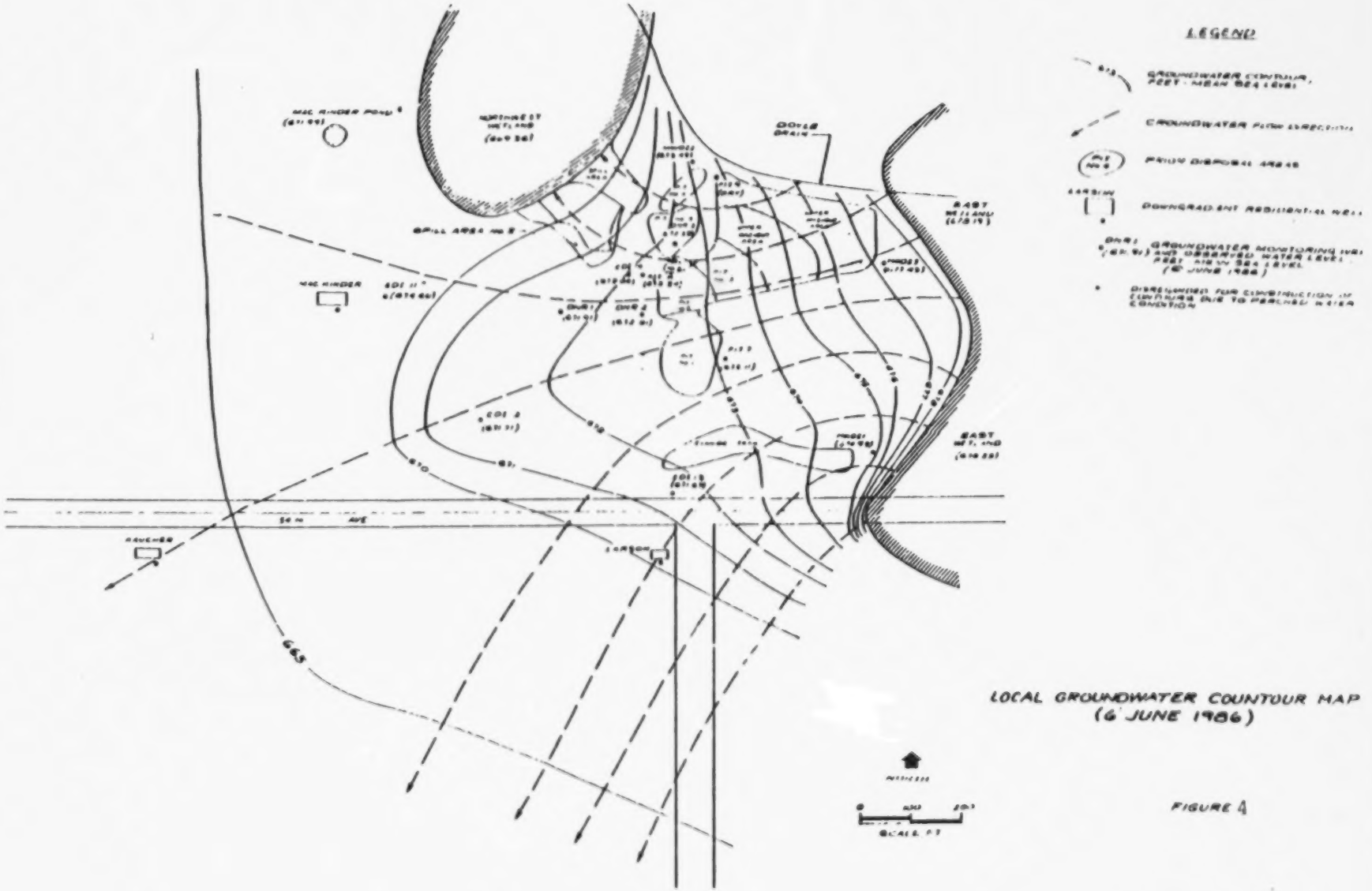
The unconfined aquifer underlying the site is a primary drinking water supply for nearby residents. Water level measurements obtained at on-site monitoring wells in June 1986 indicated the depth to the water table from the ground surface varied from approximately 1.5 feet near the wetland areas to greater than 30 feet in the southern and central portions of the site. The local ground water flow at the site is to the northwest, southwest, and west (Figure 4).

Residential wells in the site vicinity have not been impacted by contaminants at the site. Concentrations of indicator chemicals (both total and dissolved) measured in off-site residential wells are shown in Table 12. Comparable indicator chemical concentrations were found in both upgradient and downgradient wells. The measured concentrations in all tested residential wells were below Safe Drinking Water Act Primary and Secondary Standards or applicable state drinking water standards.

Two upgradient and two downgradient residential wells within 1/2 mile of the site were also tested for priority pollutants. A trace level of methylene chloride (3.2 ug/l) was detected in the sample collected from the upgradient Minshall Well. The trace level of methylene chloride is well below the lifetime health advisory allowable concentration of 350 ug/l. Methylene chloride, a common laboratory contaminant, was also found in the field blank sample at 7 ug/l. The detection of this chemical is most likely a result of procedural contamination and not representative of actual conditions at this upgradient well location. No other volatile organic compounds, semi-volatile organic compounds, pesticides or PCBs were detected in any of the samples from the residential well locations.

Concentrations of indicator chemicals measured in on-site monitoring wells were above those found in residential wells in vicinity and indicate a limited chemical plume or plumes related to the site activities (Figure 5). Test results for the indicator chemicals in the ten on-site monitoring wells are shown in Tables 13 and 14 (Figure 3).

Total concentrations of one or more indicator chemicals measured in five on-site monitoring wells exceeded Safe Drinking Water Act Standards or other applicable state drinking water standards. Dissolved concentrations of indicator chemicals measured in on-site wells were lower than the total concentrations. Dissolved concentrations of inorganics measured in three on-site wells exceeded the lowest value of Safe Drinking Water Act Primary and Secondary Maximum Contaminant Levels (MCLs) or proposed Recommended Maximum Contaminant Levels (RMCL). The MCLs for chromium (50 ug/l) and zinc (5000 ug/l) were exceeded in Well EDI-14 (108 ug/l chromium and 7229 ug/l zinc), located just downgradient of the unlined Pits excavations. The RMCL for lead (20 ug/l) and MCL for zinc were exceeded in Well EDI-13 (60 ug/l lead and 6300 ug/l zinc), located downgradient of the Cyanide Trail. Zinc is a secondary MCL which is not a health based standard. The MCL for chromium and RMCL for lead were also exceeded in MW-023 (113 ug/l chromium and 119 ug/l lead), located near the lower Washout Area at the site's east boundary. However, the installation and development of MW-023 may have been inadequate and these results are questionable.



LOCAL GROUNDWATER COUNTOUR MAP
(6 JUNE 1986)

FIGURE 4

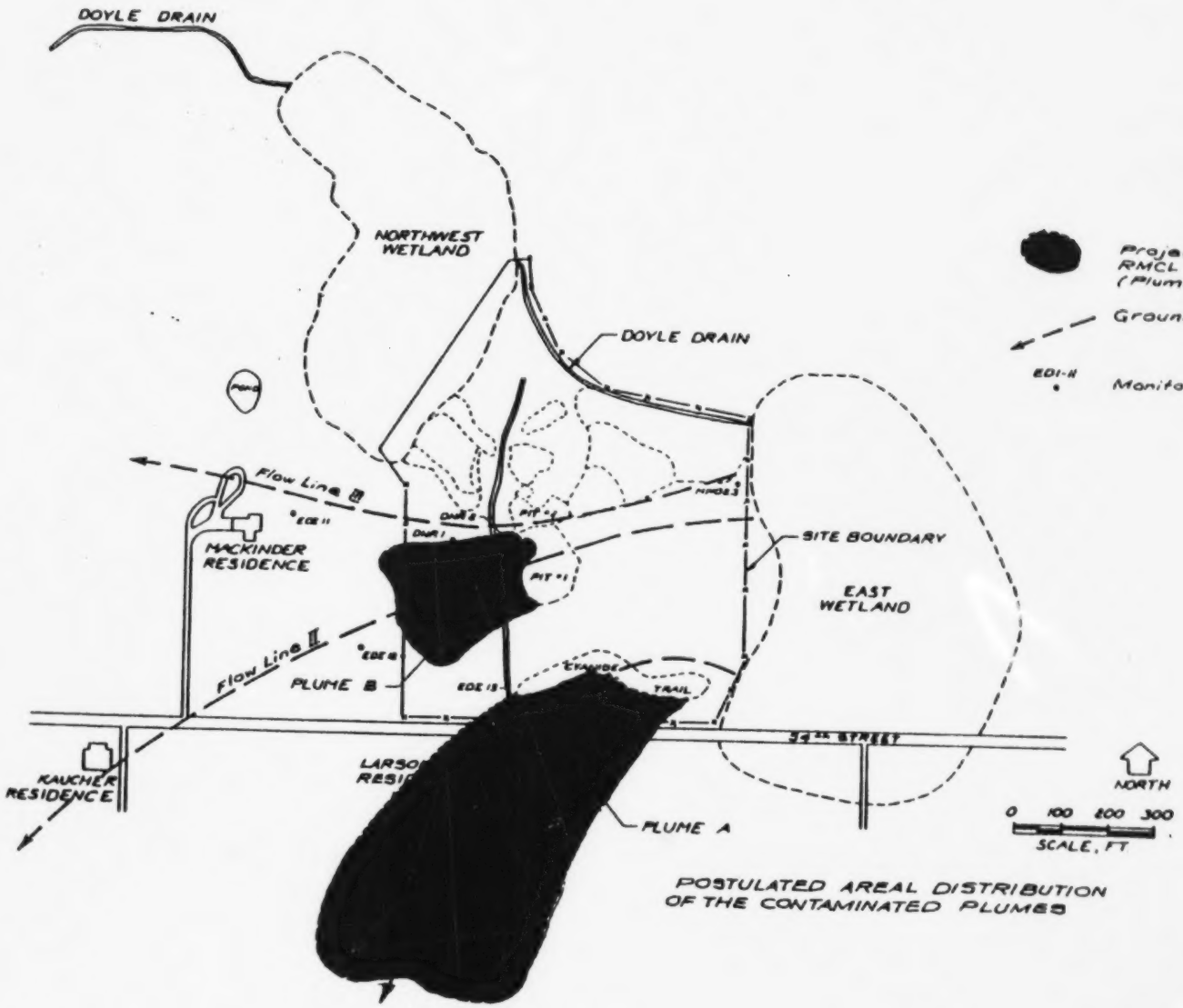
Table 12

WATER SAMPLE DATA FOR
RESIDENTIAL WELLS
INORGANIC INDICATOR CHEMICALS
(Sampled between December 4, 1985 and December 11, 1985)
Units are in ug/l

PARAMETERS	Kaucher RW001		Heinisch RW002		V. Mobile Home RW003		Minshall RW004		Larson RW005		Prouty RW006		Mackinder RW007	
	T	D	T	D	T	D	T	D	T	D	T	D	T	D
CHROMIUM	K8	K8	K8	K8	K8	K8	K8	K8	K8	K8	K8	K8	K8	K8
COPPER	11.8	K6	K6	K6	K6	K6	K6	K6	10.5	K6	K6	K6	K6	K6
LEAD	2.7	K2	K2	K2	K2	K2	K2	K2	K2	K2	K2	K2	K2	K2
NICKEL	K15	K15	K15	K15	K15	K15	K15	K15	K15	K15	K15	K15	K15	K15
ZINC	357	60.7	44.1	K40	K40	K40	357	159	101	K40	122	105	376	368
CYANIDE	K5	K5	K5	K5	K5	K5	K5	K5	K5	K5	K5	K5	K5	K5

Notes:

T = Total
D = Dissolved
K = Less than the value indicated



POSTULATED AREAL DISTRIBUTION OF THE CONTAMINATED PLUMES

FIGURE 5

Table 13

WATER SAMPLES FROM ON OR NEAR SITE MONITORING WELLS
INORGANIC INDICATOR CHEMICALS AND SUSPENDED SOLIDS
(Sampled between January 6, 1986 and January 8, 1986)
units are in ug/l unless noted

PARAMETER	EDI 11		MW021		MW023*		MW022		MDNR1		EDI 13		EDI 14		MDNR 2		MDNR 3		EDI 12	
	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D
CHROMIUM	10u	10u	20	10u	250	260	10u	10u	10u	10u	10u	10u	460	100	20	10u	10u	10u	10u	10u
COPPER	20u	20u	20u	20u	210	140	20u	20u	20u	20u	20u	20u	20u	20u	30	20u	20u	20u	20u	20u
LEAD	93	5u	16	5u	124	150	5u	5u	5u	5u	90	60	12	5u	30	5u	8	5u	106	5u
NICKEL	40u	40u	40u	40u	350	390	40u	40u	40u	40u	40u	40u	40u	40u	40u	40u	40u	40u	180	120
ZINC	3,420	180	140	20u	900	1,090	130	60	60	40	8590	6300	5720	4380	2190	440	270	80	17300	1810
CYANIDE	10u	10u	10u	10	10u	10u	10u	10u	10u	10u	10u	10u	10u	10u	10u	10u	10u	10u	10u	10u
SOLIDS, Suspended (mg/l)	332		910		2,864		938		166		36		370		120		46		1,550	

Notes:

u = Indicates the element was analyzed for but not detected. The detection limit value preceeds u (e.g. 10u).
T = Total
D = Dissolved
* = Not properly sampled. Resampling and testing was performed (See Table 1-13b).

Table 14

ADDITIONAL GROUND WATER SAMPLE DATA
(Sampled April 24, 1986)

units are in ug/l (otherwise indicated)

PARAMETERS	MW 023		EDI 14		Fire Station*	
	Total	Dissolved	Total	Dissolved	Total	Dissolved
Chromium	204	113	437	108	(5)	(4)
Copper	224	153	49	(3)	(9)	(1.7)
Lead	164	119	99	5u	5.1	5u
Nickel	277	200	66	(29)	18u	18u
Zinc	2,401	878	24,910	7,229	0.7u	(5)
Total Suspended Solids	627 mg/l		535 mg/l		215 mg/l	

Notes:

* = Water sample was taken at the fire station in Hartford. The water was used for drilling during the installation of monitoring wells MW021, MW022 and MW023.

u = Indicates the element was analyzed but not detected. The detection limit value precedes u.

( ) = Indicates the result was a value greater than or equal to the instrument detection limit but less than the contract required detection limit.

Comparison of January 1986 test results with historical data for the previously existing on-site wells indicates that there has been a downward trend in metal contaminant concentrations in the ground water beneath the unlined Pits. This trend suggests that percolation of concentrated fluids to the ground water zone may have occurred during the early stages of waste deposition. A compilation of historical data suggests a trend toward increasing concentration in the ground water a short distance downgradient form the former waste disposal areas.

Nine priority pollutant organic chemicals were detected in ground water samples from the 10 sampled on-site wells. Three of these chemicals were found in laboratory blank samples or at comparable concentrations in the field blank samples and are not considered to be representative of actual ground water quality. The other priority pollutant organic chemicals were measured at the detection limit or trace levels (below 10 ug/l) in the ground water samples and were not detected in the blanks. Some of these chemicals (1,1,1-trichloroethane, lindane, acetone and butyl benzyl phthlate) have been detected at trace levels in ground water in previous site investigations. The low organic chemical concentrations measured were not consistent to enable identification of any data trends (Remedial Investigation Report, August 19, 1986, Tables 6-18).

The organic chemical concentrations measured in the on-site ground water are below water quality standards for chemicals for which standards are available. 1,1,1-trichloroethane was detected in wells MDNR-3, EDI-14 and MW-021 at a concentration of 5 ug/l. The Safe Drinking Water Act proposed MCL for 1,1,1-trichloroethane is 200 ug/l. The herbicide lindane was detected in wells EDI-11, EDI-12, MW-021, MW-022 and MW-023 at concentrations of 0.18 ug/l. The Safe Drinking Water Act MCL for lindane is 4 ug/l; a proposed RMCL of 0.2 ug/l is pending.

No elevated levels of indicator chemicals were found in the downgradient residential wells when compared to the upgradient well concentrations. Therefore, there are no current unacceptable exposures to site contaminants by local residents drinking ground water.

1. Endangerment Assessment-Ground Water

The Endangerment Assessment has identified human ingestion of contaminated ground water as a potential exposure route. As has been noted previously, ground water is the only source of drinking water for residents in the area.

In order to assess the potential ground water contamination hazard that the site could represent, a hypothetical estimate of the configuration of plumes emanating from the site under worst case conditions was made using existing hydrogeologic data and the Vertical and Horizontal Spread (VHS) 50 Fed. Reg. 48886 (November 27, 1985) model. The VHS model estimates are worst case due to the assumptions that the source of contaminants has persisted for an infinite time and there is no sorption, precipitation or degradation. The plumes indicated by this model are conceptual and additional field data would be required to confirm the presence of the plumes.

The VHS contaminant transport model was used to determine the potential impact of the on-site ground water contamination to nearby residential wells at the Burrows site. All of the 13 houses and 25 mobile homes within 3/4 mile of the site use private wells for their water supply. These wells are screened at depths of between 60 and 90 feet. Only three residential wells are considered to be downgradient from the site (Larson, Kaucher and MacKinder). Therefore, under current ground water conditions these wells, which are located within at least 1,200 feet of the site, are the potential receptors of ground water contaminants. The model predicts that a metal contaminant plume has extended into the vicinity of one off-site downgradient residence (Larson). The Larson Well is screened between 91 and 96 feet, which is at a depth nearly 40 feet below the vertical component of the plume.

Residential well pumping in some ground water aquifers can create a cone of depression drawing contaminants toward the well screen. This is not likely to occur at the Larson well or other area wells due to the high permeability of the site aquifer. Calculations of anticipated drawdown from a residential well show that pumping at 1000 gallons per day, which is two times the average daily residential water use, results in a drawdown of less than 2.0 feet at the well location. In addition, the horizontal stratification of the glacial outwash materials would restrict downward migration of contaminants.

Based on the VHS model, three theoretical flow lines define the waste loading areas on-site. The flow lines identified from Figure 3, connecting the potential receptor wells to the contaminant sources, are as follows:

Flow Line I - from the Cyanide Trail to Larson Well;
Flow Line II - from Pit No. 1 to Kaucher Well, and
Flow Line III - from Pit No. 2 to MacKinder Well (Figure 5).

All of the flow lines originate from the East Wetland and terminate at the Paw Paw River.

Although the downgradient residential wells are not currently contaminated, future potential exposures through new drinking water wells installed within the ground water contamination is possible. Since none of the indicator chemicals found are carcinogenic, the FS has recommended the current lowest regulated concentration for each chemical to be the cleanup criterion. For example, lead has two drinking water standards (RMCL 20 ppb and MCL 50 ppb); therefore, the RMCL for lead will be the clean-up criterion for lead. Table 15 summarizes the regulated concentrations for the remaining indicator chemicals.

IV. ENFORCEMENT ANALYSIS

The identified potentially responsible parties (PRPs) for the Burrows site have received notice letters and been given the opportunity to perform the Remedial Design and Remedial Action (RD/RA) phase of the project. In July, 1986, notice letters were sent to Duane and Evelyn Funk, Elmer Burrows, Du-Wel Products, Inc., Whirlpool Corporation and Auto Specialties Manufacturing Company. A notice letter was also sent in August, 1986 to Douglas and Georgia MacKinder, the current property owners of the Burrows site. Mr. Elmer Burrows has not responded to the letter and Mr. Douglas MacKinder has declined to participate in the RD/RA. All other PRPs attended a meeting to discuss the RI/FS on

Table 15

HUMAN HEALTH STANDARDS AND CRITERIA FOR SELECTED INDICATOR CHEMICALS AT THE BURROWS SITE

Chemical	Safe Drinking Water Act Standards or Criteria (ug/liter)[a]			Acceptable Chronic Intake for Oral Exposure (mg/day)[b]	Health Advisory for 70-kg Adult (ug/liter)		Health Advisory for 10-kg Child (ug/liter)	
	Primary MCL	Secondary MCL[c]	Proposed MCL or RMCL		Longer-Term	Lifetime	1-day	10-day
Chromium	50		120 (RMCL)	103 (CrIII) 0.35 (CrVI)	840	120	1,400	1,400
Copper		1,000	1,300 (RMCL)	7			1,300	
Lead	50		20 (RMCL)	(50 ug/l)[d]	20 ug/day[f]	20 ug/day[f]		
Nickel				0.7		150		1,000
Zinc		5,000		14.9[e]				

[a] 40 CFR, Ch. 1, Parts 141 and 143, and 50 FR 46936-47025.

[b] Obtained from EPA's Health Effects Assessment Documents.

[c] Based on taste and odor.

[d] The Health Effects Assessment suggests use of the primary MCL for lead and does not provide an oral AIC.

[e] Additional exposure beyond background dietary exposure.

[f] Based on a sensitive subpopulation (fetuses and infants under two years of age).

September 9, 1986. The PRPs have raised technical concerns with the RI/FS and their comments are addressed in the Responsiveness Summary. Any negotiations with PRPs will commence following the selection of the remedial action in this Record of Decision.

V. ALTERNATIVES EVALUATION

The Feasibility Study (FS) was initiated to evaluate the appropriate remedial action at the Burrows site. The RI and Endangerment Assessment determined that based on the criteria summarized in Section III above, response actions are warranted for the following impacted environmental media:

- Wastes in Spill Area No. 2,
- Northwest Wetland surface water and sediments, and
- Ground water.

Based on the identification of these sources, impacted media, and potential receptors, the FS screened several alternatives which would be appropriate for the Burrows site. The screened alternatives are presented in Table 16. Subsequently, these alternatives were proposed for detailed evaluation based on the following parameters:

1. Constructability
2. Reliability
3. Implementation
4. Cost
5. Level of protection
6. Volume reduction
7. Adverse environmental impacts

This Record of Decision addresses multiple environmental media and as the assembled technologies are not similar for each media, the format of this summary is divided into the following categories, which includes the assembled alternative.

A. No Action Alternative (All Environmental Media)

Evaluation of the "No Action" alternative is required under Section 300.68 (g) of the National Contingency Plan (NCP). This alternative would involve no remediation of the ground water, Spill Area No. 2 and the Northwest Wetland and presents a baseline against which the adequacy the other actions can be measured. This alternative would not be protective of public health and the environment because it would not address the existing environmental degradation. If No Action was selected, the site would be ineligible for deletion from the National Priorities List (NPL) as provided in the National Contingency Plan.

Table 16

ALTERNATIVE	Capital Cost($)	O&M Cost($)	Total Present Worth Cost ($)
No Action (SS1, NWS1, GW1)	0	0	0
Spill Area No. 2 Wastes			
o Clay Cover/Revegetation (SS2)	29,100	29,200	58,300
o Excavate/Off-site Landfill Disposal (SS3)			
at 130 mi	159,100	0	159,100
at 830 mi	237,700	0	237,700
o Fence/Land Use Restrictions (SS4)	31,000	29,200	60,200
Northwest Wetland Sediments			
o Cover/Revegetate (NWS2)	18,200	1,900	20,100
o Dredge Sediments/Solidify Off-site Landfill Disposal (NWS3)			
at 130 mi	294,300	0	294,300
at 830 mi	480,700	0	480,700
o Dredge Sediments/On-site Land Application (NWS4)	88,600	11,600	100,200
o Drain Wetland (NWS5)	42,700	1,900	44,600
Ground Water			
o Extraction Wells/Above Ground Treatment/Discharge to Surface Water (GW2)	1,055,000	115,000	1,170,000
o Extraction Wells/Direct Discharge to POTW (GW3)	1,243,000	75,000	1,318,000
o Monitor Migration of Chemical Plumes (GW4)	14,900	38,700	53,600

B. Remedial Alternatives for Spill Area No. 2

1. Clay Cover/Revegetate

Soil placement over the type of wastes present in Spill Area No. 2 and revegetation has demonstrated performance, reliability and implementability. The clay material is not available at the site and would be secured off-site. Covering the contaminated wastes with 0.5 feet of clay after cutting ground surface vegetation would minimize direct exposure of the public to the contaminants. Capital, Operation & Maintenance (O&M) and Total Present Worth costs are present in Table 16.

The topography of the Burrows site prohibits this alternative from being an effective remedy. Because of the steep slope, surface erosion could create gullies which may penetrate the clay cap. This would destroy the integrity of the cap of its ability to isolate the source from direct contact and to prevent additional leachate from the waste entering into the ground water. The ground water depth varies from 1 to 30 feet under Spill Area No. 2. Capping the sludge would not assure the protection of ground water since the water table could intersect the sludge during wet seasons thereby permitting the additional introduction of waste leachate into the aquifer.

2. Excavated Wastes and Soil/Off-Site Disposal

Excavation, transportation, and disposal technologies at an off-site RCRA landfill have demonstrated positive technical performance, reliability, and implementability. The wastes would be solidified and treated for fixation prior to disposal at a facility in compliance with the EPA Off-site Policy, 50 Fed. Reg. 45933 (November 5, 1985).

The excavation, treatement, and disposal of the sludge from the Spill Area No. 2 is the cost effective remedy which would address all potential exposure routes. The removal of the visible sludge and the residual contaminated soils to the established criteria in Section III. A. above, would eliminate the potential threat for direct contact and ingestion to human health. The removal of the sludge would also assure no further introduction of leachate into the aquifer. Future land usage would be unrestricted. O&M costs would not be required for this alternative. The two costs generated for this alternative are based on the distance to two disposal facilities. The 830 mile distance was the closest RCRA permitted facility in compliance with the EPA Off-site Policy at the time of the FS publication. A closer facility, CECOS, in Williamsburg, Ohio, is currently in compliance with the Off-site Policy. Use of this facility could reduce transportation costs by more than half. Table 16 contains Capital and Total Present Worth Costs.

3. Fence/Land Use Restriction

Installation of a chain-link fence has demonstrated performance, reliability and implementability.

The installation of a fence around the spill area would isolate the source from potential direct contact and ingestion. However, the further introduction of waste leachate into the ground water would not be prevented. Consequently, this remedy is not appropriate for the Burrows site. Table 16 contains Capital, O&M, and Total Present Worth Costs.

C. Remedial Alternatives for Northwest Wetland

The Northwest Wetland was artificially created by a presently abandoned dirt road, which lacks a culvert. The road has been breached and could eventually be severely eroded.

1. Soil Cover/Revegetate

This alternative would require the covering of the contaminated sediments with one foot of fertile soil. Implementation of this alterative would be subject to meeting the criteria of Federal Executive Order for Wetlands (EO-11990) as set forth in the Wetlands Assessment.

The covering of the contaminated sediment with clean soil could potentially remove the threat to aquatic life by virtue of extending the shoreline into the wetland. However, the intergrity of the cover could be destroyed by burrowing animals or a rise in the water level in the wetland. Table 16 contains Capital, O&M, and Total Present Worth Costs.

2. Dredge/Off-site Disposal

Excavation, transportation and disposal technologies at an off-site RCRA landfill have demonstrated positive technical performance, reliability and implementability. Solidification and fixation of Northwest Wetland sediments would require bench scale studies. Dredging the contaminated sediments must meet the Section 404 of the Clean Water Act and Michigan wetland permit requirements. Approximately 350 cubic yards of wetland sediments would be removed. Some of the contaminants would likely be resuspended in the water column, resulting in an increased exposure in the short-term. However, the long term concentrations of contaminants in the water column would be reduced. No O&M costs would be associated with this alternative. Table 16 summarizes the cost for this alternative. The two costs generated for this alternative are based on the distance to two disposal facilities. The 830 mile distance was the closest RCRA permitted facility in compliance with the EPA Off-site Policy at the time of the FS publication. A closer facility, CECOS, in Williamsburg, Ohio, is currently in compliance with the Off-site Policy. Use of this facility could reduce transportation costs by more than half.

The RI did not find any concentrations of contaminants which are of potential threat to human health. However, during the predesign phase of the Remedial

Action, additional samples would be collected to define potential areas of human health threat at the base of the spill areas. These areas are expected to be minimal in size.

These contaminated sediments which could potentially impact aquatic life may extend up to 30 feet into the wetland. The excavated contaminated sediment would need to be solidified and chemically treated before disposal. The resulting waste would approximately double the volume to 700 cubic yard, thereby eliminating the cost effectiveness of the remedy when compared with the other potential remedies for this site.

3. Dredge/On-Site Land Application

Under this alternative, the dredged sediment from the Northwest Wetland would be applied on-site after pretreatment. On-site land application of the sediments in the previously excavated areas would offer some positive environmental benefits. By revegetating these areas with shallow rooted trees or shrubs, plant uptake of metals would be mostly concentrated in the wood. Metals would be either attenuated in the on-site soils or removed in a manner that protects the food chain. The addition of fertilizers may help stimulate plant growth and speed up the process of site recovery. Site revegetation would promote a healthy wildlife environment.

On-site land application of the dredged sediments will require an applicability demonstration study. The land treatment demonstration would assure minimal impact on local ground water and would have to comply with the Michigan permit requirements for operating a land application facility.

The waste application rate, cover crop, maintenance and monitoring are design related issues that need to be addressed. The facility would be a one time use facility and would be closed immediately after final waste material application. All equipment used during land application procedures would be decontaminated prior to removal from the facility.

Annual inspections of the site would be performed for a minimum five years, but possibly up to thirty years, after closure to monitor vegetation performance and surface erosion. Ground water testing would be performed on samples collected annually during the initial five years after closure. Indicator metals (chromium, copper, lead, nickel and zinc) would be tested to evaluate whether any significant leaching of the land application materials has occurred.

This alternative technology has potential application at the Burrow site. However, this remedy would require further study before implementation. The site access would have to be limited and future residential development would be restricted. The total present worth of this alternative exceeds the cost of other potential remedies, consequently, it is not considered applicable. Table 16 summarizes the costs for this alternative.

4. Drain Wetland

Technologies to drain the Northwest Wetland have demonstrated technical performance, reliability and implementability. A one-time discharge from the Northwest Wetland (approximately $4x10^6$ gallons of water) can be implemented by controlled removal of the small earth dike at the outlet of the wetland.

The weighted average concentrations of indicator metals (based on 10 sample analysis results) in the wetland water are below Michigan Surface Water Criteria or do not exceed background. Therefore, discharge water quality would comply with NPDES permit requirements.

The increased water level in the wetland due to earth fill over the discharge channel has been the prime cause of stress on the trees in the wetland. This alternative would reduce water levels and thereby allow natural remediation of the habitat. Reducing the water level would mitigate the potential threat of wetland water coming in contact with the contaminated sediments and would eliminate the potential impact on future aquatic life. Because the potential impact of water in contact with sediments would be eliminated, no further action on the sediments would be necessary.

Reducing the water level would result in an increased potential for human contact with the sediments; however, the Endangerment Assignment indicates that human contact with the sediments is not harmful. There would be no adverse effect of this technology on aquatic life since no aquatic life is currently present in the Northwest Wetland. A permanent naturally occurring wetland would remain to foster future aquatic life conditions in the vicinity of the current wetland.

Draining the wetlands would result in drying of the surface materials and may result in reintroduction of the contaminants into the environment via windblown dust or surface runoff. Neither exposure route would be significant. Windblown dust would contain lower levels of contaminants than the sediments themselves, which are not harmful to the public via ingestion at their current concentrations. Surface runoff would be minimal due to the essentially flat ground level and long distance (over 1000 feet) to the wetland area which would remain after draining the present high water level wetland.

The draining of the wetland would effectively eliminate the potential impact to aquatic life. The wetland was artificially created by an earthen dam (dirt road) across the Doyle drain, which was installed by a previous owner for access. The road was constructed without a culvert for drainage and resulted in the development of a eutrophic wetland. This wetland currently does not appear to support aquatic life. However, should the conditions change and the wetland becomes capable of supporting aquatic life, potential exposure threats would exist in the surface water adjacent to the site. Allowing the wetland to drain would restore the wetland to its smaller natural size and thereby remove

the potential for aquatic exposure to the contaminated sediments. As discussed previously, the concentrations detected during the RI did not present a potential human health threat. However, additional samples will be collected at the base of the spill areas to assure no "hot spots" exist in concentrations which may cause a human health threat. Any "hot spots" found will be dredged, treated, and landfilled with waste from the spill areas. Table 16 summarizes the cost for this alternative.

C. Ground Water

1. Extraction Wells/Above Ground Treatment/Discharge to Surface Waters

Ground water extraction and on-site treatment technologies have demonstrated performance, reliability, and implementability. The targeted levels defined in the Section III. C. above are achievable with current technology.

The water treatment system would include chemical addition and flash mixing in a flocculation tank, and a package precipitation unit. Since public access to the treatment unit would be restricted, no public health risks associated with this treatment are anticipated. Sludge dewatering is currently planned for this treatment process. The dewatered sludge would be temporarily stored on-site, and subsequently sent to a RCRA-permitted and compliant landfill. The sludge might require treatment to immobilize the toxic metal constituents prior to disposal. The contaminated ground water would be treated to meet the NPDES discharge criteria prior to its discharge into the Doyle Drain.

This alternative is the cost-effective alternative. It would achieve the defined action levels in approximately two years. The extraction of the contaminated ground water to the cleanup levels defined in Section III. C. above would effectively assure the protection of current and future consumers who depend upon this aquifer for a drinking water source. The plume would be purged and thereby eliminate any further threat to current and future consumers. Residential wells of immediate potential threat will be monitored regularly until the conclusion of the extraction program. A temporary on-site treatment facility would remove contaminants from the ground water with solid waste residuals being disposed at an off-site RCRA facility in compliance with the EPA Off-site Policy. Table 16 summarizes the cost for this alternative.

2. Extraction Wells/Direct Discharge to POTW

This alternative differs from the previous alternative only in the disposal of the contaminated ground water. Under this alternative, sewer lines would be installed from the Burrows site to a mainline for the Hartford POTW. The extraction of the contaminated ground water to the cleanup levels defined in Section III. C. above would effectively assure the protection of current and future consumers who depend upon this aquifer for a drinking water source. The plume would be purged and thereby eliminate any further threat to current and future consumers. Residential wells of immediate potential threat will be monitored regularly until the conclusion of the extraction program.

At the publication of the FS, it had not been determined whether or not the POTW would accept the contaminated ground water. It has now been determined by communication with the POTW, that the POTW will not accept industrial wastes into its treatment system. Table 16 summarizes the cost for this alternative. This remedy is not cost effective when compared with the other evaluated alternatives.

3. Monitor Migration of Chemical Plumes

Ground water monitoring would involve installation of four additional monitoring wells and periodic analyses of water samples from a total of seven monitoring wells. This technology has demonstrated performance, reliability, and implementability. Sampling and analysis of ground water are standarized procedures.

Monitoring of ground water would not improve the ground water conditions at the site. In the long-term, if this alternative were selected and the site were to be used for a private residence, the water quality in an on-site well would likely exceed Safe Drinking Water Act standards and thereby pose a long-term health risk to users.

The selection of this remedial action would not effectively assure the protection of potential drinking water supplies in the area. New drinking water wells installed within the aquifer might initially achieve drinking water standards, but might deteriorate as the plume migrates toward the Paw Paw River. The monitoring program would assist only in establishing additional information. Therefore, even though this alternative is the lowest cost, it may never achieve the defined cleanup levels and may result in reevaluating other potential remedial actions. Since the cleanup criteria has been defined for this drinking water source and since the extent of the contamination can be defined in the design phase, this remedy is not considered appropriate.

V. COMMUNITY RELATIONS

Copies of the FS were made available to the community on August 20, 1986. The Hartford Library in Hartford served as the local repository. The EPA issued a press release on August 20, 1985, announcing the availability of the study for public comment. The public comment period was extended from September 10 to September 15, 1986, at the request of the PRPs. MDNR issued a press release on September 8, which stated MDNR would accept comments until September 20. Only the PRPs submitted comments. These comments are addressed in the attached Responsiveness Summary.

VII. RECOMMENDED ALTERNATIVE

The National Oil and Hazardous Substances Contingency Plan (NCP) 40 CFR Part 300.68(j) states that the appropriate extent of remedy shall be determined by the lead agency's selection of the remedial measure which the agency determines is cost-effective (i.e., the lowest cost alternative that is technologically feasible and reliable), which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare or the environment. Based on the evaluations presented in the RI/FS, state and federal environmental requirements and public comments, the recommended alternative for this site was chosen.

In summary, the Endangerment Assessment has defined three receptor pathways that must be remedied in order to meet the intent defined of the NCP and for a permanent remedy at this site. The defined pathways are:

1) Human contact and ingestion of sludges and contaminated soils at the site,

2) Human ingestion of ground water, and

3) Potential aquatic life exposure in surface water.

The recommended multi-action remedy is considered to be a final remedy for all the impacted environmental media. Upon achieving the criteria defined in Section III above, Burrows would meet the criteria for NPL deletion as set forth at 40 CFR 300.66 (c)(7). This multi-action remedy includes:

1) Excavate, treat, and dispose of sludge and contaminated soils/sediments which exceed the defined site specific criteria at an off-site RCRA facility in compliance with the EPA Off-site Policy.

2) Confirm the theoretical extent of ground water contamination, which will then be purged until the lowest regulated concentration plus one equal volume has been achieved and treated on-site with the treated water discharged into the Doyle Drain.

3) Drain the Northwest Wetland to remove the exposure to potential aquatic life caused by surface water in contact with contaminated sediment.

The above multi-action remedy would elimate all apparent exposure routes and the need for land use restrictions. The estimated total present worth costs are summarized below and will be refined during the pre-design activity.

RECOMMENDED MULTI-ACTION REMEDY

Spill Area No. 2 Wastes	Capital Cost ($)	O&M Cost ($)	Total Present Worth Cost ($)
° at 130 mi	159,000	0	159,100
° at 830 mi	237,700	0	237,700
Northwest Wetland Sediments			
° Drain Wetland	42,700	0	42,700
Ground Water			
° Extraction wells/ Above Ground Treatment/Discharge to Surface Water	1,055,000	115,000	1,170,000

VIII. CONSISTENCY WITH OTHER ENVIRONMENTAL LAWS

All the detailed alternatives were designed to be fully compliant with applicable environmental laws. The following Federal and State requirements may be applicable for the recommended alternative.

A. Federal Laws and Regulations

Department of Transportation (DOT)
Hazardous Materials
Transportation Rules

Fresh Water Quality Criteria (FWQC)

National Pollutant Discharge
Elimination System (NPDES)

Resource Conservation
and Recovery Act (RCRA)

Executive Order (EO)
for Wetlands (11990)

Clean Water Act (CWA)
Section 404

B. Michigan Law and Regulations

Michigan Drinking Water Standards
(DWS), Safe Drinking Water Act,
399 P.A. 1986

Michigan Solid Waste Management Act,
641 P.A. 1978

Michigan Water Resources Commission Act,
245 P.A. 1929

Hazardous Waste Management Act,
64 P.A. 1979

Mineral Well Act,
315 P.A. 1969

Inland Lakes & Streams Act,
346 P.A. 1972 as amended

Wetland Protection Act,
203 P.A. 1979

The CERCLA Off-site Policy, 50 Fed. Reg. 45933 (November 5, 1985), prohibits the use of any facility that has RCRA violations, or other environmental

conditions that affect the satisfactory operation of the facility. Therefore, the off-site facility which is selected for the disposal of the sludges as well as the contaminated soils and sediments would have to be in compliance with this policy.

Drainage of the Northwest Wetland would meet the requirements for EO-11990, CWA Section 404, FWQC, and NPDES. The Wetlands Assessment attached to this document demonstrates compliance with EO-11990. Drainage of the Northwest Wetland may result in defining a point discharge requirement for NPDES. Calculations, based on available data, indicate that the surface water would meet this criteria with the exception of lead. However, the natural occurring lead concentrations for surface water appear to be higher than the NPDES requirements.

The ground water purge and treatment system will primarily be subject to the requirements of MDWS and NPDES. The recommended level of cleanup will meet or exceed all requirements. The recommended alternative for this site meets the cleanup criteria set by the State of Michigan and would fully comply with all applicable federal standards.

IX. SCHEDULE

Contingent upon available funding, the following schedule of activities for the recommended alternative has been proposed.

Approve Remedial Action (Sign ROD)	9/30/86
Design Award (notice to proceed issued)	FY 1987 Q1
Design Completion	FY 1988 Q1
Start Construction	FY 1988 Q2
Complete Construction	FY 1989 Q4

X. FUTURE ACTIONS

Upon completion of the remedial actions the site will be proposed for deletion from the NPL.

WETLANDS ASSESSMENT - STATEMENT OF FINDINGS
BURROWS SITE - NORTHWEST WETLAND

This "Statement of Findings" documents the wetlands assessment performed at the Northwest Wetlands adjacent to the Burrows site. The statement is in accordance with Executive Order 11990 - Protection of Wetlands, which requires Federal agencies to take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands.

The Burrows Sanitation Landfill Site is located adjacent to an artifically created wetland, Northwest Wetland, which was created by the placement of a dirt road installed by a previous owner across a drainage ditch to access adjoining orchards with vehicles. This dirt road was installed without a culvert. This dirt road obstructed the natural flow of the drain which thereby created or enlarged the Northwest Wetland to its current size. The flooding of this topographic depression has created an unnatural stress on a natural woodland area. The Northwest Wetland is probably high in both nutrient levels and decomposition products, and low in dissolved oxygen. Disturbance of the bottom substrate released a strong hydrogen sulfide (rotten egg) smell, which is typical of such wetlands.

The recommended remedial action for the Burrows Sanitation site includes the removal of the dirt road to permit drainage of the Northwest Wetland and would allow the natural woodland area to redevelop. This remedy will assure the prevention of future aquatic life developing adjacent to the site thereby eliminating a threat of exposure to contaminated sediment. Upon removal of the dirt road, the wetland will be restored to the natural size. This alternative has been reviewed by EPA and the Michigan Department of Natural Resources. Both agencies have concluded that the removal of the abandoned dirt road would be environmentally beneficial.

COMMUNITY RELATIONS RESPONSIVENESS SUMMARY
BURROWS SANITATION LANDFILL
HARTFORD TOWNSHIP, MICHIGAN

INTRODUCTION

This "Community Relations Responsiveness Summary" documents citizens' concerns and issues raised during the planning and preparation of the Feasibility Study (FS) for the remedial actions at the Burrows Sanitation Landfill Site (Burrows site). The comments were received by mail at the EPA's regional office located at 230 South Dearborn Street in Chicago, Illinois. Announcement of the comment period was via press release and written notices sent by the EPA and the Michigan Department of National Resources (MDNR) to residents on the site mailing list. This summary is also intended to document, for the public record, the EPA response to the comments presented during the public comment period on the FS.

The FS was completed on August 19, 1986. Copies of the document were made available to the public on August 20, 1986. A public meeting was not held during the comment period due to the apparent minimal interest generated by the RI/FS. The EPA and MDNR made an effort to contact adjacent landowners and local neighbors by individual letters regarding the FS and proposed remedies. The public comment period concluded September 20, 1986. The EPA received two sets of written comments from firms representing the potentially responsible parties. One set was submitted by Fred C. Hart Associates, Inc. on behalf of Auto Specialties Manufacturing Company, Du-Wel Products, Inc. and Whirlpool Corporation. The other comments were submitted by Michael W. Betz on behalf of Duane and Evelyn Funk. MDNR also provided comments.

COMMENTS

Disposal Areas

Comment: The alternative selected for "Spill Area No. 2" in the FS is excavation with subsequent disposal at an off-site facility. To be cost-effective, the disposal site selection should be made at the actual time of disposal.

Response: The excavation, treatment and off-site disposal of the sludge from the Spill Area No. 2 has been selected as the recommended alternative in the September 30, 1986, Record of Decision (ROD) for the Burrows site.

Two costs were generated for this alternative based on the distance to two disposal facilities. The 830 mile distance was the closest RCRA permitted facility in compliance with the EPA Off-site Policy at the time of the FS publication. A closer facility is currently in compliance with the Off-site Policy. The final site selection will be made during

the remedial action and will be based on compliance with EPA's Off-site Policy.

Comment: The first area of claimed contamination, "spill area number 2", was not discovered through analytical testing; rather, it was apparently discovered late in the remedial investigation portion of the study as a result of visual observation. There is no indication in the RI/FS study that either the lateral extent or the depth of the area of contamination was ever determined; rather, the areal extent of the area has been determined "by guess and by golly" and the extent of contamination contained within the spill area has been determined on the basis of the "assumption" that "the wastes in spill area number 2 had similar concentrations of contaminants as detected in samples of wastes from other pits, spill and washout areas...."

Response: Although Spill Area No. 2 was discovered relatively late in the remedial investigation, it was identified by analytical testing. Soil sample number SL202 and sediment sample number SD006 contained concentrations which would not be expected in the natural media. EPA also concluded that based on other sample results from the Burrows site that a visual inspection would adequately define the vertical and horizontal boundaries of the contamination. After the sludge has been removed, additional samples will be collected for analysis and levels exceeding the defined criteria in the Record of Decision will also be removed.

The quotation regarding "assumption" and "similar concentration" is in reference to the potential threat to receptors discussed in the Endangerment Assessment. To properly assess the threat of direct contact or ingestion of the sludge, EPA assumed the concentration of the contaminants were equal to the concentrations determined from previous samples collected into the pits. The low concentration of SL202 was diluted by the sampling technique and would not be representative of the potential threat. Therefore, rather than collecting a sludge sample from Spill Area No. 2, EPA used samples of similar composition from the former sludge in the pits to define the potential health hazard.

Wetlands

Comment: Justification for draining the Northwest Wetland as part of the remedial action for this site has not been provided. As specifically stated in the FS, this area is presently eutrophic and as such, not currently capable of supporting

aquatic life. The limiting factor in the suitability of the wetlands to support aquatic life is not the impact of past operations at the Burrows site but the eutrophic conditions noted in the FS. Although there may be benefits to draining this area from a general environmental standpoint, the justification for these actions to be funded as part of the remedy for the Burrows site is lacking. The FS states on page 11 of Section 1 that prior disposal activities have had a "limited" impact on surface water and sediments. This impact is limited to within 30 feet of the site borders which serves as a "mixing zone". Whereas, the average concentration of substances of concern in the wetland area are below Michigan Surface Water Quality Criteria or background levels (lead). These concentrations are acceptable under Michigan Rule 57 (upon which the Michigan Surface Water Quality Criteria are based) which makes allowance for a "mixing zone".

Response: The EPA acknowledges that the Northwest Wetland does no appear to be capable of currently supporting aquatic life because of the present eutrophic conditions and prior disposal which has had limited impact on the wetland. However, it is also the responsibility of the EPA to protect potential aquatic life which may depend on the wetland in the future, should environmental conditions change and become capable of supporting such aquatic life.

Comment: ... the single highly-elevated contaminant levels found in the surface water of the northwest wetlands was obtained, if the RI/FS reads correctly, by having one of the samplers stand on the sedimented soils in order to make a depression for purposes of water collection. The water which then collected in his footprint was sampled. What the report does not state, however, is exactly where that boot had been immediately prior to its pivotal role in what purports to be a "scientific" sampling technique.

Response: The water sample collected within the footprint was not a "scientific" sampling technique and was not depended upon as an accurate representation. An additional set of samples were collected under better defined procedures which eliminated the potential of indirect contamination. Under the redefined procedure the second set of sediment samples still showed the presence of contamination.

Ground Water

Comment: The analysis performed in identifying risk to receptors of area groundwater is inadequately presented in the RI/FS due to the lack of site and constituent-specific hydrogeologic information. The FS presents a potential scenario of migration of source constituents which is extremely conserv-

ative (VHS Model) and, as presented in the FS, is inadequate to evaluate or select a final remedial action for this media. The data provided on current on-site ground water concentrations is extremely limited and needs to be further developed so that a realistic assessment of potential risk can be made. The present analysis utilizes one point in space and an aquifer permeability which is higher than physically measured to define a three-dimensional "plume". No verification data is presented to confirm the presence of the "plume" or to calibrate the model to site-specific conditions. The FS clearly states that the design of the extraction system is a "key element" of remedial response actions and recommends the installation of additional monitoring wells to define the "plume". Due to the fact that the "contaminant plumes" identified by EPA are relatively dilute and that existing groundwater supplies have not been impacted, no imminent hazard has been identified and sufficient time is available to properly evaluate groundwater conditions through continued or expanded monitoring. This will provide more reliable information on concentration trends than the theoretical, conservative approach presented in the FS. The FS clearly states (Section 1, pg. 17) that the "plumes indicated by the model are conceptual and additional field data would be required to confirm the (emphasis added) of the plumes". As presented, the methodology presented in the FS only indicates the area of potential concern and warrants additional investigation prior to the selection of a remedial alternative. The limited database is presently inadequate to determine the necessity for or properly design and cost a groundwater remediation system; this was not the intended use of the VHS model. The VHS model is intended to identify areas of potential concern and allow plume investigation to proceed in a focused, phased approach, not as a substitute for site-specific solute transport models. As utilized in the RI/FS, the required model verification data is lacking; the collection of these data is deferred to the design phase of the remedial alternative. Logically, these data should be collected as part of the Remedial Investigation so that the Feasibility Study can be developed on actual conditions. In its present form, the groundwater remedial analysis is a theoretical exercise and is inadequately supported to meet the intent of the RI/FS process. The development of proper design parameters would require aquifer testing including pump and slug tests. It is likely that the concentrations encountered in such a study would present significantly different site conditions than those utilized in the FS to develop and evaluate remedial alternatives. The conclusion presented in the RI that the

model presents "worst case" conditions is also unsupported. At least one additional sampling location would be required to substantiate this conclusion. As such, the analysis of the applicability and potential cost of alternatives evaluated in the FS is flawed. For example, the feasibility of direct discharge to the POTW or surface water cannot be adequately evaluated without reasonable estimates of flow and constituent concentrations. As presented by EPA at our meeting, direct sewer discharge has been totally dismissed due to lack of POTW treatment capacity. This decision cannot be made without reasonable and supportable estimates of groundwater withdrawal rates and quality, and an investigation of POTW capability and cost.

Response: The EPA recognizes the advantages in further defining the extent of ground water contamination at the Burrows site and supports further definition of the plume during the remedial design stage. However, EPA is basing the decision to pump and treat the ground water on the existence of contamination. First, the presence of contaminated ground water has been established by sampling monitoring wells with the boundaries being theoretically defined through conservative and "worst case" assumptions. The contaminants sampled, no matter how "relatively dilute", are a potential health hazard to any new drinking water wells developed within this potential Class I aquifer. Further, the site will not be eligible for deletion from the NPL until the cleanup criteria are achieved. EPA has determined that as long as this potential threat to future ground water users exists, the selected alternative will not change. Adequate information was available to select an appropriate remedy and meet the criteria required under the NCP. Consequently, any additional monitoring to define the plume may be construed as unnecessary remedial investigation. The design proposed in the FS was based on the plume defined by the model as a cost comparison mechanism for +50% to -30% as defined in the NCP. The placement of more monitoring wells during the remedial design stage is appropriate because more specifics of the plume boundary will be necessary to develop an effective purge system. The site specific Record of Decision has defined the cleanup levels for ground water and the additional ground water data collected during the design stage will be used to design an effective site-specific purge system.

The POTW was not dismissed from the decision process. The Record of Decision considered this alternative. Further, the FS presented cost estimates based on the proposed purge system. Under this alternative, sewer lines would be installed from the Burrows site to a mainline for the Hartford POTW. At the publication of the FS it had not been determined whether or not the POTW would accept the

contaminated ground water. It has now been determined by communication with the POTW that the POTW will not accept industrial wastes into its treatment system. Further, this alternative is not a cost-effective alternative.

Comment: The MDNR suggested the following concept of "milestones" be incorporated into the purging remedial action to achieve acceptable ground water quality.

1) Purging the ground water until drinking water levels are achieved at all monitoring wells.

2) Purging a volume of water equal to that in No. 1 or until all monitor wells are less than levels of detection.

3) EPA and MDNR determining after completion of No. 1 and No. 2 above whether additional purging is necessary.

Response: It is EPA policy to define a clean up level for any remedial action when it is intended to be the final remedy. EPA will be able to accomodate Michigan's request because the cleanup criteria for the ground water have been defined as the lowest regulated concentration for the particular indicator chemical. The purging of one additional volume can also be justified because although definition of the plume will be further defined during the remedial design phase, the exact extent of the plume can never be completely defined. This additional volume of purging will assure no elevated levels remain in the ground water to threaten human health. Item number 3 will be accomplished through the amended risk assessment which will be required before determining that no further repsonse is appropriate.

Comment: ... the "plume" of contaminated ground water which the EPA would expect to find were sample wells to be sunk appears to be based on a modeling technique which may or may not bear any relationship whatsoever to the actual conditions found on site. Indeed, the RI/FS study clearly indicates that the contaminated ground water plume projection contained in the RI/FS report constitutes a "worst-case scenario", with substantial possibility that true site conditions are substantially different from those projected by the VHS modeling technique.

Response: The EPA agrees that the model represent the "worst-case scenario". However, the Agency has concluded the purging of the contaminated ground water would still be the selected alternative even if the actual boundaries were known at this time. Therefore, EPA has defined the cleanup levels and will continue to define the actual extent of the plume under the remedial design phase prior to designing and implementing the detailed purge system.

Alternative Selection

Comment: For all alternatives presented, no concise summary of scores for evaluation criteria is presented. The narrative format utilized represents a subjective methodology and provides no insight as to how the technologies evaluated scored on a comparative basis with respect to the identified criteria.

For example, the utilization of alternative water sources (bottled water, new well installation) was discussed as nonapplicable due to "no imminent hazard potential" on table 2-2, however, treatment of groundwater is selected as a component of the selected alternative to "eliminate the potential risk to current and future groundwater users". In light of the extremely limited number of downgradient receptors to groundwater, the utilization of alternative water supplies appears to be more feasible than presented in the FS. Since alternative water supplies were not evaluated and direct discharge to the POTW and the potential for on-site use of groundwater have been summarily dismissed, no comparison of relative costs and benefits can be made. The selection of a specific methodology of groundwater treatment is arbitrary at this time and does not meet the intent of the FS process.

Response: Section IV of the Feasibility Study (FS) presents a detailed evaluation of each alternative for final remedy. As defined in the RI/FS guidance, the alternatives were evaluated on established technical criteria, environmental criteria and cost factors. Each alternative was closely scrutinized based on the individual points in each evaluation criteria. The across-the-board application of these criteria to the alternatives was in effort to objectively compare the alternatives.

Each alternative was singularly analyzed to determine its technically feasibility, the adverse and beneficial environment effects, and the total dollar cost. There has been no attempt by the Agency to rate or score each alternative. The evaluation was devised to demonstrate whether or not the specific criteria set forth in the NCP was met. Based on the most favorable evaluation, an alternaive was chosen as the recommended remedial action.

This analysis is most effective and efficient method to evaluate the identified alternatives and choose a recommended action. A scoring system was not constructed for comparison purposes due to the questionable accuracy of such a system and the belief the such a potentially complex and elaborate scoring system would not only be cost prohibitive but would be no more effective than the present method. In addition

to the concerns presented, the Agency has settled on a nationwide approach in evaluating alternatives as discussed in EPA's Guidance on Feasibility Studies Under CERCLA (June 1985).

In reference to the selection of purge and treatment of ground water, EPA has established up front that the contaminated ground water at the site presents a potential health risk to present and future users of ground water drawn from the shallow aquifer. With this in mind, extraction of contaminated ground water was determined to be a necessity and not a debatable issue. The FS evaluated two courses of action in regards to treatment of ground water, those being on-site treatment or removal to the POTW for treatment. Due to the refusal of the local POTW to accept industrial waste, on-site treatment is felt to be the most feasible alternative.

General

Comment: EPA should use a Negotiation Decision Document (NDD) rather than a Record of Decision (ROD) for its decision at this site

Response: Consistent with the EPA February 27, 1985, Guidance Document "Preparation of Decision Documents for Approving Fund-Financed and Potentially Responsible Party Remedial Actions Under CERCLA", a ROD is required for all remedial actions financed with monies from the Trust Fund. A ROD has been prepared selecting the cost-effective remedy for the Burrows site and establishing the cleanup criteria for the remedy.

While negotiations are underway, a NDD sets out the approved range of negotiating flexibility. It is an internal Agency document which is not released to the public. A NDD is virtually identical to a ROD, except that it may provide for this flexibility in negotiating the remedy. As the RI/FS is completed and the cleanup criteria are established, such flexibility is not necessary.

The cleanup levels in the ROD must be met by EPA or by the PRPs. The ROD sets forth the remedy EPA will implement. EPA expects any remedy proposed by PRPs to be equivalent or better than the remedy in the ROD.